PB83-168690

Evaluation of Advanced Combustion Modifications on Industrial Process Equipment (Data Supplement B)

KVB, Inc.
Irvine, CA

Prepared for

Industrial Environmental Research Lab.
Research Triangle Park, NC

Feb 83

U.S. Department of Commerce
National Technical Information Service
NTIS

PB83-168690

EPA-600/7-83-011b
February 1983

EVALUATION OF ADVANCED COMBUSTION MODIFICATIONS ON INDUSTRIAL PROCESS EQUIPMENT
(DATA SUPPLEMENT B)

Subscale and Full-Scale Mineral Kilns; Full-Scale Wood-Fired Boilers; and a Subscale Steel Furnace

by

R. J. Tidona, H. J. Buening, R. A. Frohoff

KVB, Inc.
18006 Skypark Boulevard
Irvine, California 92714

Contract No. 68-02-2645

EPA Project Officer: Robert E. Hall

Industrial Environmental Research Laboratory
Office of Environmental Engineering and Technology
Research Triangle Park, North Carolina 27711

Prepared for:

U. S. Environmental Protection Agency
Office of Research and Development
Washington, D. C. 20460

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA-600/7-83-011b	2.	3. RECIPIENT'S ACCESSION NO. PB83 168690
4. TITLE AND SUBTITLE Evaluation of Advanced Combustion Modifications on Industrial Process Equipment (Data Supplement B)		5. REPORT DATE February 1983 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) R. J. Tidona, H. J. Buening, and R. A. Frohoff		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS KVB, Inc. 18006 Skypark Boulevard Irvine, California 92714		10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO. 68-02-2645
12. SPONSORING AGENCY NAME AND ADDRESS EPA, Office of Research and Development Industrial Environmental Research Laboratory Research Triangle Park, NC 27711		13. TYPE OF REPORT AND PERIOD COVERED Supplement; 1/78-4/81 14. SPONSORING AGENCY CODE EPA/600/13

15. SUPPLEMENTARY NOTES IERL-RTP project officer is Robert E. Hall, Mail Drop 65, 919/541-2477.

16. ABSTRACT The Data Supplement, presented in two volumes, documents data in greater detail than was practical in the final reports for this contract. It provides details to researchers interested in performing their own analyses. Readers are referred to the contract final reports for information on objectives, selection of units, measurement procedures, interpretations, and conclusions. (The reports are: (1) Application of Advanced Combustion Modifications to Industrial Process Equipment: Subscale Test Results, EPA-600/7-82-021 (NTIS PB82-239310), April 1982; (2) Evaluation of Combustion Variable Effects on NOx Emissions from Mineral Kilns (in press); and (3) Evaluation of Combustion Modification Effects on Emissions and Efficiency of Wood-fired Industrial Boilers (in preparation).) Data for gaseous emission concentrations of NO, NOx, CO, HC, and SO2 are in parts per million by volume (ppm) on a dry basis corrected to 3 percent O2 by volume (dry) in the flue gas. Data in this volume are arranged by Location No. for Locations 2,3,4,5,6,8, and 9. A location is defined as one company or plant in which one or more units were tested. Each unit tested at a location is identified by a Unit No. The contract final reports refer to test numbers when data are discussed. Test numbers are of the form xx/yy-zz: xx = Location No., yy = Test Series No., and zz = Test No. in that series.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS		b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group	
Pollution	Cements	Pollution Control	13B	11B
Combustion Control	Steel Converters	Stationary Sources	21B	11F
Industrial Processes	Nitrogen Oxides	Combustion Modification	13H	07B
Heating Equipment	Minerals	Cement Kilns	13A	08G
Petroleum Industry	Flue Gases	Flue Gas Recirculation	05C	
Kilns				
Wood			11L	

18. DISTRIBUTION STATEMENT Release to Public	19. SECURITY CLASS *(This Report)* Unclassified	21. NO. OF PAGES 367
	20. SECURITY CLASS *(This page)* Unclassified	22. PRICE

EPA Form 2220-1 (9-73)

NOTICE

This document has been reviewed in accordance with U.S. Environmental Protection Agency policy and approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

Limitations on Application of Data Reported

The data cited in this report are test results for measured pollutant emissions from a wide variety of industrial combustion equipment types. Only a limited number of each equipment type could be tested. Therefore, these emission levels are not suitable for use in estimating mean emissions from industrial combustion equipment classes and should not be used alone in compiling area-wide emission inventories. Also, used alone they are not suitable for predicting emissions from any one process or for setting regulatory limits or emission standards. Use of these emissions as emission standards may place a large proportion of the industrial combustion device population in noncompliance. The data can, however, be of use in supplementing other data used for these purposes. The purpose of this test program was to investigate the feasibility of combustion modifications for emissions control, not to develop a comprehensive emissions data base.

CONTENTS

Section Page

FOREWORD vi

INSTRUMENTATION ix

CONVERSION FACTORS x

DATA SUPPLEMENT B

LOCATION 2 - SUBSCALE CEMENT KILN 379*

- Unit Description 380
- Mobile Laboratory Data 381
- Unit Operating Data 389
- Natural Gas Fuel Analysis 397

LOCATION 3 - WOOD/BARK BOILER 398

- Unit Description 399
- Mobile Laboratory Data 400
- Control Room Data Sheet 413
- Fuel Analyses 439
- Particulate Emission Calculations 440
- Smokestack Flow Profile 448
- Stack Data 449
- Cascade Impactor Data Sheet 453
- Brink Impactor Data Reduction 457
- Plume Opacity Observation Record 459
- SO_x Data Sheet 460

LOCATION 4 - SUBSCALE STEEL FURNACE 462

- Unit Description 463
- Mobile Laboratory Data 464
- Unit Operating Data 490
- Fuel Analyses 516
- SO_x Data Sheet 517

(*) Pages 1-378 are in Data Supplement A.

CONTENTS (continued)

Section | Page

LOCATION 5 - HOGGED FUEL BOILER 519

- Unit Description 520
- Mobile Laboratory Data 521
- Unit Operating Data 552
- Hogged Fuel and No. 6 Oil Analyses 604
- Particulate Emission Calculations 605
- Stack Data 627
- Brink Cascade Impactor Data Sheet 638
- Brink Cacscade Impactor Lab Worksheet 646
- Brink Impactor Data Reduction 653
- SO_x Data Sheet 660

LOCATION 6 - LIME KILN 662

- Unit Description 663
- Mobile Laboratory Data 664
- Unit Operating Data 672
- Fuel Analyses 679
- SO_x Data Sheet 680

LOCATION 8 - PREHEATER/PRECALCINER CEMENT KILN 682

- Unit Description 683
- Mobile Laboratory Data 684
- Summary of Process Data 689
- Coal Fuel Analyses 691
- Particulate Emission Calculations 692
- Stack Data 694
- Andersen Cascade Impactor Data 697
- Smokestack Flow Profile 698
- SO_x Data Sheet 699

CONTENTS (continued)

Section | Page

LOCATION 9 - WET PROCESS CEMENT KILN 701

- Unit Description 702
- Mobile Laboratory Data 703
- Unit Operating Data 710
- Fuel Analysis 720
- Particulate Emission Calculations 721
- Stack Data 727
- Smokestack Flow Profile 730

DATA SUPPLEMENT A

LOCATION 1 - SUBSCALE PROCESS HEATER 1

LOCATION 7 - REFINERY PROCESS HEATER (SET 1) 141

LOCATION 7 - REFINERY PROCESS HEATER (SET 2) 322

FOREWORD

The purpose of this Data Supplement, which is presented in two volumes, is to document data in greater detail than was practical in the final report for this contract. It is intended to provide the necessary details to other researchers who are interested in performing their own analysis.

Readers are referred to the contract final reports for information as to objectives, selection of units, measurement procedures, interpretations, and conclusions*†§.

All data presented for gaseous emission concentrations of NO, NO_x, CO, HC, and SO_2 are expressed in parts per million by volume (ppm) on a dry basis corrected to 3 percent O_2 by volume (dry) in the flue gas.

The data are arranged in this volume by Location Number for Locations 2, 3, 4, 5, 6, 8, and 9. A location is defined as one company or plant in which one or more units were tested. Each unit tested at a location is identified by a unit number. The contract final reports refer to the test number when data are discussed. The test number is of the form xx/yy-zz, where xx = location number, yy = test series number (e.g. oxygen variations, load variations, register adjustments, etc.), and zz = test number in that series.

---

*Hunter, S. C., et al., "Application of Advanced Combustion Modifications to Industrial Process Equipment: Subscale Test Results," final report for EPA Contract No. 68-02-2645, submitted September 1981.

†Tidona, R. J., et al., "Evaluation of Combustion Variable Effects on NO_x Emissions from Mineral Kilns," final report for EPA Contract No. 68-02-2645, submitted December 1981.

§Tidona, R. J., et al., "Evaluation of Combustion Modification Effects on Emissions and Efficiency of Wood-Fired Industrial Boilers," final report for EPA Contract No. 68-02-2645, submitted January 1982.

For each unit tested, the data supplement contains the following information:

1. Equipment Design Data

   Design data tabulations include: unit description, installation date, process capacity, burner description, fuels burned, combustion air temperature and other data pertinent to each unit.

2. Mobile Laboratory Data (Emission Measurements)

   Emission measurements tabulated for each test include test number, test load, combustion conditions (O_2, CO_2), gaseous emissions (NO_x, NO, CO, HC, and SO_2 all at 3 percent O_2, dry), total particulates and solid (filterable) particulates, thermal efficiency, Bacharach smoke spot number, and plume opacity.

3. Operating Data

   Data pertinent to the process are tabulated for each test.

4. Fuel Analyses

   Analyses of test fuels are included as reported for fuel samples collected during tests.

5. Particulates Measurement Data

   Particulates data include measurements of total and solid particulates by EPA Method 5.

6. Cascade Impactor Data

   Impactor data include impactor flow conditions, stage collection weights, and calculated aerodynamic particle size for each stage.

One impactor used was a Brink Model B (BMS-11) with the following stage dimensions:

Jet No.	Jet Dia., cm	Spacing of Jet Opening, cm
1	0.6325	1.897
2	0.4509	1.354
3	0.3546	1.064
4	0.2403	0.716
5	0.1857	0.559

The second impactor used was an Anderson 2000 Mark III with the following stage dimensions:

Stage No.	Jet Diameter, cm
1	0.1638
2	0.1253
3	0.0948
4	0.0759
5	0.0567
6	0.0359
7	0.0261
8	0.0251

7. Opacity Data

Plume opacity was observed by EPA Method 9.

8. Stack Traverse Data

Stack traverses are made with a pitot tube.

Dash marks entered on the data forms indicate that data were not available.

INSTRUMENTATION

All emission measurement instrumentation was carried in a 12.8 m x 2.4 m (8 x 42 ft) mobile laboratory trailer. The gaseous species measurements were made with analyzers located in the trailer. The particulate concentration, particulate size, and sulfur oxides measurements were made by instrumentation prepared in the wet chemistry area of the laboratory and taken to the sample port. Weighing and titrations were done either in or near the mobile laboratory or in KVB's stationary laboratory facility.

The emission measurement instrumentation used was the following:

EMISSION MEASUREMENT INSTRUMENTATION

Species	Manufacturer	Measurement Method	Model No.
Hydrocarbon	Beckman Instruments	Flame Ionization	402
Carbon Monoxide	Beckman Instruments	IR Spectrometer	865
Oxygen	Teledyne	Polarographic	326A
Carbon Dioxide	Beckman Instruments	IR Spectrometer	864
Nitrogen Oxides	Thermo Electron Co.	Chemiluminescent	10A
Particulates	Andersen Samplers, Inc.	EPA Method 5 Train	EPA
Sulfur Dioxide	DuPont Instruments	UV Spectrometer	400
Particle Sizing	Andersen Samplers, Inc. Monsanto-Brink	Cascade Impactor	Mark III B (BMS-11)
Smoke Spot	Bacharach	ASTM 2156-65	RCC
Opacity		EPA Method 9	
Sulfur Oxides (SO_x)		Goksoyr-Ross	

CONVERSION FACTORS

SI units to Metric or English units

To Obtain	From	Multiply By
g/Mcal	ng/J	0.004186
10^6 Btu	GJ	0.984
Btu	gm cal	3.9685×10^{-3}
lb/10^6 Btu	ng/J	0.00233
ft	m	3.281
in.	cm	0.3937
ft^2	m^2	10.764
ft^3	m^3	35.314
lb	kg	2.205
Fahrenheit	Celsius	$t_F = 9/5(t_C) + 32$
Fahrenheit	Kelvin	$t_F = 1.8t_K - 460$
psig	Pa	$P_{psig} = (P_{pa})(1.450 \times 10^{-4}) - 14.7$
psia	Pa	$P_{psia} = (P_{pa})(1.450 \times 10^{-4})$
iwg (39.2°F)	Pa	$P_{iwg} = (P_{pa})(4.014 \times 10^{-3})$
10^6 Btu/hr	MW	3.413
GJ/hr	MW	3.60

To obtain ppm at 3% O_2 of	Multiply* Concentration in ng/J by
Natural Gas Fuel	
CO	3.23
HC	5.65
NO or NO_x	1.96
SO_2 or SO_x	1.41
Oil Fuel	
CO	2.93
HC	5.13
NO or NO_x	1.78
SO_2 or SO_x	1.28
Coal Fuel	
CO	2.69
HC	4.69
NO or NO_x	1.64
SO_2 or SO_x	1.18

*These conversions depend on fuel composition.
The values given are for typical fuels.

CONVERSION FACTORS

English or Metric units to SI units

To Obtain	From	Multiply By	To obtain ng/J of	Multiply* Concentration in ppm @ 3% O_2 by
ng/J	lb/10^6 Btu	430	Natural Gas Fuel	
ng/J	g/Mcal	239	CO	0.310
GJ	10^6 Btu	1.055	HC	0.177
m	ft	0.3048	NO or NO_x (as NO_2)	0.510
cm	in.	2.54	SO_2 or SO_x	0.709
m^2	ft^2	0.0929		
m^3	ft^3	0.02832		
kg	lb	0.4536	Oil Fuel	
Celsius	Fahrenheit	$t_C = 5/9\ (t_F - 32)$	CO	0.341
Kelvin	Fahrenheit	$t_K = 5/9\ (t_F - 32) + 273$	HC	0.195
Pa	psig	$P_{pa} = (P_{psig} + 14.7)(6.895 \times 10^3)$	NO or NO_x (as NO_2)	0.561
Pa	psia	$P_{pa} = (P_{psia})(6.895 \times 10^3)$	SO_2 or SO_x	0.780
Pa	iwg (39.2°F)	$P_{pa} = (P_{iwg})(249.1)$	Coal Fuel	
MW	10^6 Btu/hr	0.293	CO	0.372
MW	GJ/hr	0.278	HC	0.213
			NO or NO_x (as NO_2)	0.611
			SO_2 or SO_x	0.850

*These conversions depend on fuel composition. The values given are for typical fuels.

LOCATION 2 - SUBSCALE CEMENT KILN

ROTARY KILN DESIGN DATA

Location No. 2 **Unit No.** —

Unit Description SUBSCALE ROTARY CEMENT KILN
- 13cm ID, 30cm OD, 4.6m LONG
- 0.0015 Kg/s MAXIMUM FEED RATE

Installation Date	—
Process Capacity	0.0015 Kg/s (12 lb/h) OF FEED
Burner Description	CYLINDRICAL PIPE WITH COAXIAL AIR INJECTION
Test Fuel	NATURAL GAS
Combustion Air Temperature at Burner	AMBIENT
Length of Kiln	4.6m (15 ft)
Diameter of Kiln	13cm (5") ID ; 30cm (12") OD

Comments:

MOBILE LABORATORY DATA

Test No.________

Test No. 2/3-1 Date 6-17-78 Location 2 Engr. Tidona

Unit No.________ Fuel NG Capacity________

Unit Type Research Kiln Burner Type________

1. Test No.	2/3-1		2/3-2		2/3-3		2/3-4		2/3-5	
2. Date										
3. Time	1415		1430		1445		1625		1640	
4. Load										
5. Process Rate (Btu/h)	2.73×10^3		→		→		2.77×10^5		2.73×10^3	
6. Flue Diam. or Size, ft										
7. Probe Position	HOT LINE DUST BOX		→		→		→		→	
8. Oxygen (%)	0.20		0.15		0.10		0.20		0.40	
9. NOx (hot) read/3% O_2 (ppm)*	71	61	1	1	-	-	0	0	3.0	2.6
10. NO (hot) read/3% O_2 (ppm)*	71	61	1	1	1	1	0	0	2.5	2.2
11. NO_2 (hot) read/3% O_2 (ppm)*	0	0	0	0	-	-	0	0	0.5	0.4
12. NO (cold) read/3% O_2 (ppm)*	74	64	1	1	-	-	0	0	3.0	2.6
13. Carbon Dioxide (%)	13.4		12.4		12.4		11.9		11.9	
14. Carbon Monoxide (ppm) uncor/cor*	470	407	>2000	>1727	>2000	>1722	>2000	>1731	950	830
15. Hydrocarbon (ppm) uncor/cor*	35	30	25	22	—	—	60	52	—	—
16. Sulfur Dioxide (ppm) uncor/cor*	40	35	40	35	~1000	~8[illegible]	792	685	334	292
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	81		81		81		82		82	
19. Dew Point Temp. (°F/°C)	—		-		-					
20. Atmos. Pressure (in. Hg)	29.32		29.32		29.72		29.24		29.24	
21. Relative Humidity (%)	—		-		-					
22.										
23.	BASELINE		ADD		ADD		ADD		SULFUR	
24.			SULFUR		SULFUR		SULFUR		BURNOUT	
25.			LO RATE		HIGH RATE		MED RATE			
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA Test No.________

Test No. 2/3-6 to 2/4-2 Date 3-18-78 Location 2 Engr. Tidona

Unit No.________ Fuel NG Capacity________

Unit Type Research Kiln Burner Type________

LOW-SO3 FEED, HIGH BINDER → HIGH SO3 FEED, HIGH BINDER

1. Test No.	2/3-6		2/3-7		2/4-1		2/4-1		2/4-2	
2. Date										
3. Time	1005		1035		1150		1420		1430	
4. Load										
5. Process Rate (Btu/h)	2.63×10^5		→							
6. Flue Diam. or Size, ft										
7. Probe Position	DUST BOX CENTER		2.0		1.9		2.1		→	
8. Oxygen (%)	1.8		~~3.0~~		~~2.89~~		~~3.1~~		3.5-4.0	
9. NOx (hot) read/3% O_2 (ppm)*	58	54	51	48	54	51	55	52	–	–
10. NO (hot) read/3% O_2 (ppm)*	57	53	50	47	48	45	38	36	–	–
11. NO_2 (hot) read/3% O_2 (ppm)*	1	1	1	1	6	6	17	16	–	–
12. NO (cold) read/3% O_2 (ppm)*	69	65	60	57	51	48	46	44	34	35
13. Carbon Dioxide (%)	12.0		11.5		10.4		9.9		9.4	
14. Carbon Monoxide (ppm) uncor/cor*	30	28	20	19	20	19	20	19	20	21
15. Hydrocarbon (ppm) uncor/cor*	68	64	75	71	75	71	35	33	100	104
16. Sulfur Dioxide (ppm) uncor/cor*	20	19	10	9	0	0	0	0	120	125
17. Smoke Spot (Bacharach)	–		–		–					
18. Atmos. Temp. (°F/°C)	76°F		76°		76°		83°		83°	
19. Dew Point Temp. (°F/°C)	–									
20. Atmos. Pressure (in. Hg)	29.30		29.30		29.27		29.20		29.20	
21. Relative Humidity (%)	–									
22.										
23.										
24.	BASELINE		ADD SULFUR		BASELINE		BASELINE		ADD S	
25.	HIGH O_2									
26.										
27.										
28. POSSIBLY	SOME LEAKAGE INTO PROBE AT CONNECTION									
29.	TO HEATED LINE DUE TO PROBE BLOCKAGE. ~ 1% O_2									
30.	DIFFERENCE (TESTS 2/3-7, 2/4-1)									

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.

Test No. 2/4-3 to 4 Date 8-18-78 Location 2 Engr. T-[illegible]

Unit No. Fuel NG Capacity

Unit Type Research Kiln Burner Type

1. Test No.	2/4-3		2/4-4				
2. Date							
3. Time	1500		1505				
4. Load							
5. Process Rate (Btu/h)	2.63×10^5		→				
6. Flue Diam. or Size, ft							
7. Probe Position	DUSTBOX CENTER		→				
8. Oxygen (%)	3.1		2.4				
9. NOx (hot) read/3% O_2 (ppm)*	49	51	51	49			
10. NO (hot) read/3% O_2 (ppm)*	42	44	45	41			
11. NO_2 (hot) read/3% O_2 (ppm)*	7	7	6	5			
12. NO (cold) read/3% O_2 (ppm)*	45	47	48	46			
13. Carbon Dioxide (%)	10.2		10.4				
14. Carbon Monoxide (ppm) uncor/cor*	20	21	50	48			
15. Hydrocarbon (ppm) uncor/cor*	—	—	130	126			
16. Sulfur Dioxide (ppm) uncor/cor*	15	16	240-680	252-658			
17. Smoke Spot (Bacharach)							
18. Atmos. Temp. (°F/°C)	85°F		85°F				
19. Dew Point Temp. (°F/°C)							
20. Atmos. Pressure (in. Hg)	29.17		29.17				
21. Relative Humidity (%)							
22.							
23.							
24.	BASELINE		ADD S				
25.							
26.							
27.							
28.							
29.							
30.							

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.

Test No. 215-1to5 Date 8-18-78 Location 2 Engr. Tidona

Unit No. Fuel NG Capacity

Unit Type Research Kiln Burner Type

HIGH S, HIGH BINDER FEED

1. Test No.	215-1		215-2		215-3		215-4		215-5	
2. Date										
3. Time	1525		1545		1620		1625		1640	
4. Load										
5. Process Rate (Btu/h)	2.77×10^5		→		2.75×10^5		→		→	
6. Flue Diam. or Size, ft										
7. Probe Position	DUSTBOX CENTER		→		→		→		→	
8. Oxygen (%)	2.3-2.8		2.05		2.2		2.05		1.7	
9. NOx (hot) read/3% O_2 (ppm)*	44	43	46	44	46	44	40	38	52	49
10. NO (hot) read/3% O_2 (ppm)*	34	33	40	38	42	40	33	31	46	43
11. NO_2 (hot) read/3% O_2 (ppm)*	10	10	6	6	4	4	7	7	6	6
12. NO (cold) read/3% O_2 (ppm)*	46	45	46	44	55	53	47	45	59	55
13. Carbon Dioxide (%)	10.2		10.6		10.6		10.6		12.0	
14. Carbon Monoxide (ppm) uncor/cor*	25	24	25	24	25	24	55	52	25	23
15. Hydrocarbon (ppm) uncor/cor*	115	113	95	90	70	67	65	62	83	77
16. Sulfur Dioxide (ppm) uncor/cor*	50	49	20	19	20	19	20	19	10	9
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	85		85		87		87		87	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.20		29.20		29.17		29.17		29.17	
21. Relative Humidity (%)										
22.										
23.										
24.	BASELINE		WATER		WATER		WATER		REPEAT	
25.	HIGH S		ADDITION		ADDITION		ADDITION		BASELINE	
26.	FEED		6 ml/min		11.1 ml/min		26.7 ml/min			
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.

Test No. 2/6-1 to 5 Date AUG 21 1978 Location 2 Engr. Tilma

Unit No. Fuel NG Capacity

Unit Type Research Kiln Burner Type

LOW-SO_3, HIGH BINDER FEED

1. Test No.	2/6-1		2/6-2		2/6-3		2/6-4		2/6-5	
2. Date										
3. Time	0900		0930		0950		1010		1205	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position	~~HOT~~ LINE DUST BOX		—		—		—		→	
8. Oxygen (%)	1.3		1.6		1.5		1.55			
9. NOx (hot) read/3% O_2 (ppm)*	67	61	60	56	55	51	56	52	NO	
10. NO (hot) read/3% O_2 (ppm)*	63	58	59	55	53	50	52	48		
11. NO_2 (hot) read/3% O_2 (ppm)*	4	4	1	1	2	1	4	4	READINGS	
12. NO (cold) read/3% O_2 (ppm)*	70	73	70	65	71	66	78	73		
13. Carbon Dioxide (%)	11.4		11.2		11.6		11.2			
14. Carbon Monoxide (ppm) uncor/cor*	35	32	30	28	25	23	30	28		
15. Hydrocarbon (ppm) uncor/cor*	20	18	12	11	10	9	9	8		
16. Sulfur Dioxide (ppm) uncor/cor*	0	0	0	0	0	0	0	0		
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	74°F		74°F		74°F		74°F			
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.63		29.64		29.64		29.64			
21. Relative Humidity (%)										
22.					Small leak in hot					
23.					line - use first 2 data pts					
24.	BASELINE		KILN DUST		for moisture →				KILN DUST	
25.			INSUFFLATION						INSUFFLATION	
26.			~1 g/min		~3 g/min		~3.5 g/min		(LO O_2)	
27.			(NORMAL		O_2) →				NO	
28.									DUST	
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.________

Test No. 2/6-5 to 2/7-1 Date AUG 21 1978 Location________ Engr. T

Unit No.________ Fuel NG Capacity________

Unit Type Research Kiln Burner Type________

LOW SO3 HIGH BINDER FEED

1. Test No.	2/6-5		2/6-6		2/6-7		2/6-8		2/7-1	
2. Date										
3. Time	1310		1320		1345		1355		1435	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position	[illegible]		DUST [illegible]		→					
8. Oxygen (%)	0.25		0.10		0.15		0.30		0.18	
9. NOx (hot) read/3% O_2 (ppm)*	36	31	16	14	36	31	61	53	63	54
10. NO (hot) read/3% O_2 (ppm)*	35	30	15	13	31	27	58	50	55	47
11. NO_2 (hot) read/3% O_2 (ppm)*	1	1	1	1	5	4	3	3	8	7
12. NO (cold) read/3% O_2 (ppm)*	40	35	18	16	44	40	83	72	63	54
13. Carbon Dioxide (%)	12.0		12.2		12.4		12.8		12.8	
14. Carbon Monoxide (ppm) uncor/cor*	~260	226	1240	1068	~1700	~1470	~340	296	990	851
15. Hydrocarbon (ppm) uncor/cor*	8	7	25	22	15	13	30	26	21	18
16. Sulfur Dioxide (ppm) uncor/cor*	20	17	20	17	20	17	0	0	40	34
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	80°F		80°		81°		71			
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.61		29.61		29.59		29.59		29.59	
21. Relative Humidity (%)										
22.										
23.										
24.	BASELINE		KILN DUST				REPEAT		FLY ASH	
25.	(LO O_2)		INJECTION		→		BASELINE		INJECTION	
26.			LO		HI				LO O_2	
27.							(Checked		1g/min	
28.							CO_2 inst.			
29.							calib.)		O_2	
30.									changed	

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.________

AUG 21 1978

Test No. 2/7-2to3 **Date**________ **Location**________ **Engr.** Tiemen

Unit No.________ **Fuel** NG **Capacity**________

Unit Type Research Kiln **Burner Type**________

LOW SO_3 HIGH /BINDER FEED

1. Test No.	2/7-2		2/7-1		2/7-2		2/7-3			
2. Date										
3. Time	1442		1530		1550		1610			
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position	DUST BOX CENTER		DUST BOX CENTER		DUST BOX CENTER		DUST BOX CENTER			
8. Oxygen (%)	0.05 /		0.4		0.3		0.3			
9. NOx (hot) read/3% O_2 (ppm)*	1.13	1.1	90	79	88	77	133	116		
10. NO (hot) read/3% O_2 (ppm)*	1.3	1.1	88	77	86	75	130	113		
11. NO_2 (hot) read/3% O_2 (ppm)*	0	0	2	2	2	2	3	3		
12. NO (cold) read/3% O_2 (ppm)*	3.8	3.3	115	100	102	89	133	116		
13. Carbon Dioxide (%)	12.5		13.2		13.2		12.8			
14. Carbon Monoxide (ppm) uncor/cor*	>2000	1718	260	227	500–2000	435–1718	228	198		
15. Hydrocarbon (ppm) uncor/cor*	50	431	18	16	14	12	12	10		
16. Sulfur Dioxide (ppm) uncor/cor*	40	34	20	17	0	0	10	9		
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	79°F		78°F		78°F		77°F			
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.59		29.59		29.58		29.57			
21. Relative Humidity (%)										
22.										
23.	FLY ASH						REPEAT			
24.	INJECTION		→		→		BASELINE			
25.	LO O_2		→							
26.	3g/min		1g/min		3g/min					
27.			= NO changing							
28.			rapidly as O_2							
29.	O_2		changed & figures							
30.	changed		are approximate.							

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.______

Test No. 2/7-4 to 7 Date AUG 21 1978 Location 2 Engr. T. Tura

Unit No.______ Fuel NG Capacity______

Unit Type Research Kiln Burner Type______

Low SO_2, high Binder feed

1. Test No.	2/7-4		2/7-5		2/7-6		2/7-7			
2. Date										
3. Time	1655		1705		1720		1735			
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position	DUST BOX CENTER		DUST BOX CENTER		DUST BOX CENTER		DUST BOX CENTER			
8. Oxygen (%)	1.5		1.5		1.8		1.6			
9. NOx (hot) read/3% O_2 (ppm)*	78	72	66	61	64	60	85	79		
10. NO (hot) read/3% O_2 (ppm)*	78	72	66	61	64	60	83	77		
11. NO_2 (hot) read/3% O_2 (ppm)*	0	0	0	0	0	0	2	2		
12. NO (cold) read/3% O_2 (ppm)*	89	82	79	73	76	71	104	96		
13. Carbon Dioxide (%)	11.8		11.7		11.7		11.6			
14. Carbon Monoxide (ppm) uncor/cor*	30	28	160	142	40	38	218	202		
15. Hydrocarbon (ppm) uncor/cor*	20	18	12	11	8	8	11	10		
16. Sulfur Dioxide (ppm) uncor/cor*	0	0	0	0	0	0	0	0		
17. Smoke Spot (Bacharach)	—									
18. Atmos. Temp. (°F/°C)	77°F		76°F		75°F		75°F			
19. Dew Point Temp. (°F/°C)	—		—		—		—			
20. Atmos. Pressure (in. Hg)	29.57		29.55		29.54		29.54			
21. Relative Humidity (%)										
22.										
23.										
24.	Baseline		Flyash		Injection		Repeat			
25.	High O_2		→		→		Baseline			
26.			1.1g/min		3.3g/min					
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

UNIT OPERATING DATA

Test No._______

Test No. 2/3-1 Date 8-17-78 Location 2 Engr. Tiwa

Unit No._______ Fuel NG Capacity_______

Unit Type Research Kiln Burner Type_______

LOW-S FEED WITH MORE BINDER, LO-DUST LOADING

1. Test Number	2/3-1	2/3-2	2/3-3	2/3-4	2/3-5
2. Date	8/17	8/17		FINE FEED NO GYPSUM	
3. Time	1414	1435	1445	1620	1639
4. Load					
5. Process Rate					
6. Fuel Flow (x2.[illegible] scfh)	98.5	98.5	98.5	100.0	98.5
7. Feed Flow (lb/hr)	8.4	8.4	8.4	6.2	6.2
8. Flame Zone Temp (°F)	2850	2790	2760	2775	2780
9. Feed Pipe Temp (°F)	940	940	940	950	940
10. Cyclone Inlet Temp.	1068	1068	1068	1050	1060
11. Kiln shell Temp. (Flame Z.) (°F)	640	640	640	640	640°
12. Back End O2 (%)	0.1	—	?	.5→0.1	0.55
13. Sulfur w/ Pyrite Feed Rate (g/h)	0	35g/7.5min	16g/min	47[illegible]/7min	None
14.					(Sulfur
15.					burnout)
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

Data Sheet 6002-1

UNIT OPERATING DATA

Test No.________

Test No. 2/3-6 to 2/4-1 Date 8-18-78 Location 2 Engr. Tidona

Unit No.________ Fuel NG Capacity________

Unit Type Research Kiln Burner Type________

LOW-SO_3 FEED S IN SULFUR OFF

1. Test Number	2/3-6	2/3-7	2/3-7	2/4-1	2/4-1
2. Date					
3. Time	10:05	10:25	10:33	11:50	14:17
4. Load					
5. Process Rate					
6. Fuel Flow (x2.72 scfh)	98 → 95	95	95	95	95
7. Feed Flow (lb/hr)	7.4	7.4	7.4	7.4	3.6
8. Flame Zone Temp (°F)	2700 → 2710	2710	2710	2690	2700
9. Feed Pipe Temp (°F)	1000	990	980	980	990
10. Cyclone Inlet Temp.	1070	1058	1058	1048	1040
11. Kiln shell Temp (°F) (zone 2)	640	640	640	640	640
12. Back End O_2 (%)	1.1 → 1.85	2.5-2.2 2.1-2.9	2.0	1.9	2.1
13. Sulfur Feed Rate (g/h) ~~[illegible]~~ w/injection	0	270g/hr	0	0	0
14.					
15.					
16.	BASELINE	SULFUR		BASELINE	→
17.	HIGH O_2	INJECTION		HIGH SO_3 FEED	
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

Data Sheet 6002-1

UNIT OPERATING DATA

Test No.

Test No. 2/4-1404 Date 8-18-78 Location 2 Engr.

Unit No. Fuel NG Capacity

Unit Type Research Kiln Burner Type HIGH-SO_3 FEED HIGH BINDER

	S in	"baseline"	hi S		
1. Test Number	2/4-2	2/4-3	2/4-4		
2. Date	8/18	8/18	8/18		
3. Time	1425-1430	1500	1505 (1502-1508)		
4. Load					
5. Process Rate					
6. Fuel Flow (x2.[illegible])	95	95	95		
7. Feed Flow (lb/hr)	3.6#/hr	6#/hr	6#/hr		
8. Flame Zone Temp (°F)	2700°F	2640	2670		
9. Feed Pipe Temp (°F)	990	970	970		
10. Cyclone Inlet Temp.	1045	1040	1045		
11. Kiln shell Temp (°F) ([illegible])	640	640	640		
12. Back End O_2 (%) ~~[illegible]~~ with time	25-4.2	1.9	2.1-2.5		
13. Sulfur Feed Rate (g/h)	26g/5min	0	50g/6min		
14.					
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

UNIT OPERATING DATA

Test No.________

Test No. 2/5-1 to 5 Date 8-18-78 Location 2 Engr.________

Unit No.________ Fuel NG Capacity________

Unit Type Research Kiln Burner Type________

HIGH SO_3, HIGH BINDER

1. Test Number	2/5-1	2/5.2	2/5-3	2/5-4	2/5-5
2. Date					
3. Time	1528	1534	1609	1618	1640
4. Load					
5. Process Rate					
6. Fuel Flow (x2.222 scfh)	100	100	99.5	99.5	99.5
7. Feed Flow (lb/hr)	6 lb/hr	6 #/hr	6#/hr	6#/hr	6#/hr
8. Flame Zone Temp (°F)	2660	2700	2725	2680	2720
9. Feed Pipe Temp (°F)	980	980	470	970	970
10. Cyclone Inlet Temp	1035	1038	1048	1050	1045
11. Kiln shell Temp (°F, 2)	640	640	650	650	640
12. Back End O_2 (%)	1.6-2.6	1.85	1.95	1.8	1.5
13. Sulfur Feed Rate (g/h)	0	0	0	0	0
14. Water ml/min	0	50 ml/8min 2 sec.	50 ml / 4 min 35 sec	200 ml/	0
15.			99.5 ml/9 min	7½ min	
16.					
17.	BASELINE	Water	→	→	REPEAT
18.		Addition			BASELINE
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

Data Sheet 6002-1

UNIT OPERATING DATA

Test No.

Test No. 2/6-1 to 5 Date AUG 2 1978 Location 2 Engr. Tidona

Unit No. Fuel NG Capacity

Unit Type Research Kiln Burner Type

LOW SO_3, HIGH BINDER FEED

1. Test Number	2/6-1	2/6-2	2/6-3	2/6-4	2/6-5
2. Date	8/21	8/21	8/21	8/21	8/21
3. Time	0900	0930	0950	1007	1205
4. Load					
5. Process Rate					
6. Fuel Flow (x2.722 scfh)	90	89	89	89	92
7. Feed Flow (lb/hr)	3.5	4.8	4.8	4.8	6.0
8. Flame Zone Temp (°F)	2700	2660	2590	2560	2720
9. Feed Pipe Temp (°F)	900	900	890	895	900
10. Cyclone Inlet Temp.	990	985	990	985	1032
11. Kiln shell Temp (°F Zone 2)	600	600	625	~600	650
12. Back End O_2 (%)	1.0-1.7	1.3	1.5	1.55	0.55
13. Sulfur Teledyne Feed Rate (g/h)	none	none	none	none	none
14. dust feed lb/hr	0	1.125 g/min	3.14 g/min	3.57 g/min	none
15.				(0.47#/h)	
16.					
17.					
18.	BASELINE	KILN			KILN DUST
19.		DUST	→	→	INSUFFLATION
20.		INSUFFLATION	(NORMAL O_2)		(LOW O_2)
21.					NO
22.					DUST
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

Data Sheet 6002-1

UNIT OPERATING DATA

Test No.______

Test No. 2/6-5 to 8 Date AUG 21 1978 Location 2 Engr. Tidona

Unit No.______ Fuel NG Capacity______

Unit Type Research Kiln Burner Type______

1. Test Number	2/6-5	2/6-6	2/6-7	Use 2/6-7	2/6-8
2. Date					
3. Time	1303	1310	1325	1345	1350
4. Load					
5. Process Rate					
6. Fuel Flow ([illegible])	92	92	92	92	92
7. Feed Flow (lb/hr)	6.0	6.0	6.0	6.0	6.0
8. Flame Zone Temp (°F)	2710	2720 (?)	2660	2730	2780
9. Feed Pipe Temp (°F)	895	890	890	895	895
10. Cyclone Inlet Temp.	1010	1000	1000	995	995
11. Kiln shell Temp. ([illegible] °F)	640	650	640	640	650
12. Back End O_2 (%)	0.3	0.12	0.20	0.10	0.10
13. [illegible] Feed Rate (g/h)	0	25g/16min	25g/7min	38g/19min	none
14.					
15.		Lo dust	Hi dust	Hi dust	
16.	Baseline	(Kiln dust injection)	→	→	Baseline
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

Data Sheet 6002-1

UNIT OPERATING DATA

Test No.

Test No. 2/7-1 & 2 Date AUG 21 1978 Location 2 Engr. T. [illegible]

Unit No. Fuel NG Capacity

Unit Type Research Kiln Burner Type

Repeat

1. Test Number		2/7-1	2/7-2	2/7-1	2/7-2
2. Date	1424	1430	1448	1530	15:45
3. Time					
4. Load					
5. Process Rate					
6. Fuel Flow ([illegible])	92.5	92.5	92.5	925	94
7. Feed Flow (lb/hr)	6	6	6	6	6
8. Flame Zone Temp (°F)	2780	2775-2765	2755	2720	2750
9. Feed Pipe Temp (°F)	900	890	890	885	890
10. Cyclone Inlet Temp.	980	985	980	970	965
11. Kiln shell Temp. (°F) ([illegible])	675	670	680	675	690
12. Back End O_2 (%)	0.1	0.0-0.02	0.05	0.3-0.4	0.3-0.7
13. Sulfur Feed Rate (g/h) w/ ~~[illegible]~~ Temp (°C)					
14. Fly ash injection rate (g/min)	0.0	1gm/min.	3gm/min	1gm/min	3gm/min
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

Data Sheet 6002-1

UNIT OPERATING DATA

Test No.

Test No. 2/7-3 to 7 Date Location 2 Engr. Tidona

Unit No. Fuel NG Capacity

Unit Type Research Kiln Burner Type

1. Test Number	2/7-3	2/7-4	2/7-5	2/7-6	2/7-7
2. Date	1606	1655	1710	1722	1735
3. Time					
4. Load					
5. Process Rate					
6. Fuel Flow (x[illegible])	92	92	92.5	92.5	92.0
7. Feed Flow (lb/hr)	6	6	6	6	6
8. Flame Zone Temp (°F)	2760	2760	2765	2700	2740
9. Feed Pipe Temp (°F)	890	890	885	850	890
10. Cyclone Inlet Temp.	970	970	980	970	970
11. Kiln shell Temp. (°F Flame Z)	670	675	670	675	670
12. Back End O_2 (%)	.3 - .4	1.3	1.5 - 1.6	1.65	1.4
13. S~~ulfur Feed Rate~~ (~~g/hr~~) [illegible]					
14. FLYASH INJECTION RATE (g/min)	none	none			0
15.			11g in 10min	30g in 9min	
16.	REPEAT				
17.	BASELINE	BASELINE	FLYASH	→	REPEAT
18.			INJECTION		BASELINE
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

Data Sheet 6002-1

NATURAL GAS FUEL ANALYSIS (TYPICAL)

Component	Volume %
Nitrogen	1.7
Hydrogen	0.1
Carbon Dioxide	0.5
Methane	95.0
Ethane	2.0
Propane	0.5
Butane	0.2
High Heating value, dry, J/m^3 (Btu/CF)	37.89x10^6 (1017)
Specific gravity	0.5816

LOCATION 3 - WOOD/BARK BOILER

WOOD-BARK BOILER

Location No. 3 **Unit No.** 5

Unit Description

Wood - Bark Boiler
45,400 Kg/Hr. (100,000 lb/Hr.)

Installation Date 1966

Heater Rating

Burner Description Detroit spreader stoker with undergrate and overfire air.

Test Fuel Combinations

Wood - Bark and Coal

Fuel Temp. at Burner (°F) Ambient

Primary Air Temp. (°F) 489°K (420°F)

Comments:

MOBILE LABORATORY DATA

Test No.

Test No.
Date APR 11 1979 Location 5
Engr.

Unit No. 5
Fuel Bark & Coal
Capacity 100 K

Unit Type Wickes W. T.
Burner Type Stoker

1. Test No.	3-1		3-2		3-3		3-4			
2. Date	4-11-79		4-11-79		4-11-79		4-11-79			
3. Time	14:05		16:00		16:50		17:30			
4. Load lb/Hr x 10^3	82		83							
5. Process Rate										
6. Flue Diam. or Size, ft	58" x 58"									
7. Probe Position	Center		CENTER		CENTER		CENTER			
8. Oxygen (%)	9.3		10.8		8.2		7.75			
9. NOx (hot) read/3% O_2 (ppm)*	005	-	005	-	005	-	005	-		
10. NO (hot) read/3% O_2 (ppm)*	155	238	210	424	135	190	110	149		
11. NO_2 (hot) read/3% O_2 (ppm)*	005	-	005	-	005	-	005	-		
12. NO (cold) read/3% O_2 (ppm)*	150	231	223	394	131	184	107	145		
13. Carbon Dioxide (%)	10.5		8.6		12.4		12.8			
14. Carbon Monoxide (ppm) uncor/cor*	235	362	325	574	275	387	365	498		
15. Hydrocarbon (ppm) uncor/cor*	0	0	0	0	0	0	0	0		
16. Sulfur Dioxide (ppm) uncor/cor*	440	677	410	724	460	647	430	584		
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	42									
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)										
21. Relative Humidity (%)										
22.										
23.			BASELINE + ~1%							
24.										
25.	Baseline				Low O_2		Low O_2			
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA Test No. 3-5

Test No. 3 Date 4/12 Location 3 Engr.

Unit No. 5 Fuel Bark & Coal Capacity 100 K

Unit Type Burner Type Stoker

1. Test No.	3-5					
2. Date	4/11					
3. Time	1050					
4. Load lb/Hr ×10³	35					
5. Process Rate						
6. Flue Diam. or Size, ft						
7. Probe Position	center					
8. Oxygen (%)	11.85					
9. NOx (hot) read/3% O_2 (ppm)	92	181				
10. NO (hot) read/3% O_2 (ppm)	92	181				
11. NO_2 (hot) read/3% O_2 (ppm)	0	0				
12. NO (cold) read/3% O_2 (ppm)	104	205				
13. Carbon Dioxide (%)	8.3					
Carbon Monoxide (ppm) uncor/cor	310	613				
15. Hydrocarbon (ppm) uncor/cor	0	0				
16. Sulfur Dioxide (ppm) uncor/cor	136	268				
17. Smoke Spot (Bacharach)						
18. Atmos. Temp. (°F/°C)	44					
19. Dew Point Temp. (°F/°C)						
20. Atmos. Pressure (in. Hg)						
21. Relative Humidity (%)						
22.						
23.						
24.						
25.						
26.						
27.						
28.						
29.						

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.________

Test No. 3 Date 4-13-79 Location 3 Engr. G. Q.

Unit No. 5 Fuel Coal & Bark Capacity 100 k

Unit Type Wickes W.T. Burner Type Stoker

1. Test No.	3-6		3-6		3-6					
2. Date	4-13-79		4-13-79		4-13-79					
3. Time	11:25		12:50		14:20					
4. Load #/Hr x 10^3	80		80		80					
5. Process Rate										
6. Flue Diam. or Size, ft	58" x 58"		→							
7. Probe Position	CENTER		CENTER		CENTER					
8. Oxygen (%) -	9.0		8.6		8.4					
9. NOx (hot) read/3% O2 (ppm) wet	185	278	129	187	129	184				
10. NO (hot) read/3% O2 (ppm)		175	260	127	184	127	181				
11. NO2 (hot) read/3% O2 (ppm)	12	18	2	3	2	3				
12. NO (cold) read/3% O2 (ppm) dry	205	308	165	240	135	193				
13. Carbon Dioxide (%)	9.2		10.1		10.3					
Carbon Monoxide (ppm) uncor/cor	85	128	205	298	315	450				
15. Hydrocarbon (ppm) uncor/cor	0	0	50	73	175	250				
16. Sulfur Dioxide (ppm) uncor/cor	1270	1905	460	668	430	614				
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	51		51		49					
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.85				29.87					
21. Relative Humidity (%)										
22.										
23.										
24.	Baseline Partial Test									
25.			→							
26.										
27.										
28.										
29.										

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.________

Test No.__________ Date 4-16-79 Location________________ Engr. G. Q.

Unit No. 5 Fuel Coal & Bark Capacity 100 K#/Hr.

Unit Type Wickes W.T. Burner Type Stoker

1. Test No.	3-7		3-8		3-9		3-10			
2. Date	4-16-79		4/16		4/16		4/16			
3. Time	1110		1125		1155		1605			
4. Load #/Hr x 10^3	55		53		55		57			
5. Process Rate										
6. Flue Diam. or Size, ft	58" x 58"		—				-			
7. Probe Position	center		center		center		center			
8. Oxygen (%)	10.1		8.7		11.0		9.8			
9. NOx (hot) read/3% O_2 (ppm)	100	165	102	149	148	266*	122	196		
10. NO (hot) read/3% O_2 (ppm)	98	162	102	149	150	270	120	193		
11. NO_2 (hot) read/3% O_2 (ppm)	2	3.3	0	0	2	3.6	2	3.2		
12. NO (cold) read/3% O_2 (ppm)	120	198	116	170	170	306	125	201		
13. Carbon Dioxide (%)	9.8		10.8		8.4		9.4			
14. Carbon Monoxide (ppm) uncor/cor	625	1032	345	505	115	207	365	587		
15. Hydrocarbon (ppm) uncor/cor	125	206	0	0	0	0	575	924		
16. Sulfur Dioxide (ppm) uncor/cor	240	396	360	527	960	1728	140	225		
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	48		50		53					
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)										
21. Relative Humidity (%)										
22.										
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

Data Sheet 6002-2

MOBILE LABORATORY DATA **Test No.**

Test No. **Date** 17 April '79 **Location** 3 **Engr.** HB

Unit No. 5 **Fuel** COAL/BARK **Capacity**

Unit Type **Burner Type** STOKER

1. Test No.	3-11		3-12		3-13		3-14			
2. Date	4-17-79		4-17-79		4-17-79		4-17-79			
3. Time	09:50		10:30		11:10		12:15			
4. Load (10^3 lb/hr)	78		78		78		78			
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position	CENTER		CENTER		CENTER		CENTER			
8. Oxygen (%)	9.6		10.4		10.6		9.8			
9. NOx (hot) read/3% O_2 (ppm)	127	201	162	275	207	358	172	276		
10. NO (hot) read/3% O_2 (ppm)	120	189	157	267	196	339	167	268		
11. NO_2 (hot) read/3% O_2 (ppm)	7	12	5	8	11	19	5	8		
12. NO (cold) read/3% O_2 (ppm)	137	216	175	297	240	415	194	312		
13. Carbon Dioxide (%)	8.7		8.9		8.1		8.3			
14. Carbon Monoxide (ppm) uncor/cor	170	268	179	304	50	87	80	129		
15. Hydrocarbon (ppm) uncor/cor	1200	1895	1175	1995	775	1341	450	723		
16. Sulfur Dioxide (ppm) uncor/cor	640	1011	940	1596	1600	2769	1560	2507		
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	52		53		55		57			
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.58		30.57		30.58		30.58			
21. Relative Humidity (%)										
22.										
23.	BASELINE O_2									
24.					HIGH O_2					
25.			HIGH O_2				BASELINE O_2			
26.										
27.										
28.										
29.										
30. FUEL	COAL + BARK		COAL + BARK		COAL		COAL			

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.________

Test No.________ Date 17 April '79 Location 3 Engr. HB

Unit No. 5 Fuel COAL Capacity 100 K lbs/hr

Unit Type________ Burner Type STOKER

1. Test No.	3-15		3-15		3-15			
2. Date	4-18-79		4-18-79		4-18-79			
3. Time	10:10		10:50		11:40			
4. Load lb/hr x 10^3	78		78		78			
5. Process Rate								
6. Flue Diam. or Size, ft								
7. Probe Position	CENTER		CENTER		CENTER			
8. Oxygen (%)	9.6		9.7		9.8			
9. NOx (hot) read/3% O_2 (ppm)	165	261	170	271	176	283		
10. NO (hot) read/3% O_2 (ppm)	163	257	166	264	168	270		
11. NO_2 (hot) read/3% O_2 (ppm)	2	4	4	7	8	13		
12. NO (cold) read/3% O_2 (ppm) dry	185	292	182	290	183	294		
13. Carbon Dioxide (%)	9.2		8.9		8.6			
14. Carbon Monoxide (ppm) uncor/cor	195	308	185	295	162	260		
15. Hydrocarbon (ppm) uncor/cor	2050	3237	1377	2193	1300	2089		
16. Sulfur Dioxide (ppm) uncor/cor	680	1074	760	1211	780	1254		
17. Smoke Spot (Bacharach)								
18. Atmos. Temp. (°F/°C)	53							
19. Dew Point Temp. (°F/°C)								
20. Atmos. Pressure (in. Hg)								
21. Relative Humidity (%)								
22.								
23.								
24.	PARTICULATE	NORMAL O_2	PARTICULATE	NORMAL O_2	PARTICULATE	NORMAL O_2		
25.								
26.								
27.								
28.								
29.								
30.								

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.

Test No. Date 18 April 1979 Location 3 Engr. HB

Unit No. 5 Fuel Coal / Bark Capacity 10^5 lb/hr

Unit Type Burner Type Stoker

1. Test No.	3-16		3-17		3-18					
2. Date	4-18-79		4-18-79		4-18-79					
3. Time	14:20		15:30		16:10					
4. Load lb/Hr x 10³	78		80		78					
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position	CENTER		CENTER		CENTER					
8. Oxygen (%)	10.4		9.2		8.5					
9. NOx (hot) read/3% O_2 (ppm)	145	246	124	189	150	187				
10. NO (hot) read/3% O_2 (ppm)	143	243	122	186	137	197				
11. NO_2 (hot) read/3% O_2 (ppm)	2	3	2	3	-	-				
12. NO (cold) read/3% O_2 (ppm) ~y	180	306	149	227	165	238				
13. Carbon Dioxide (%)	7.7		7.6		10.1					
14. Carbon Monoxide (ppm) uncor/cor	265	450	180	275	165	238				
15. Hydrocarbon (ppm) uncor/cor	3950	6708	3050	4653	1200	1728				
16. Sulfur Dioxide (ppm) uncor/cor	380	645	400	610	600	864				
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	80		82		82					
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.57		30.58		30.58					
21. Relative Humidity (%)										
22.										
23.										
24.	O_2 VARIATION TEST		O_2 VARIATION TEST		O_2 VARIATION TEST					
25.										
26.										
27.										
28.										
29.										
30. FUEL	COAL/BARK		COAL/BARK		COAL/BARK					

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.________

Test No.__________ Date 19 April 1979 Location 3 Engr. HP

Unit No. 5 Fuel COAL/WOOD Capacity 10^5 lb/hr

Unit Type__________ Burner Type STOKER

1. Test No.	3-19		3-20		3-21		3-22			
2. Date	4-19-79		4-19-79		4-19-79		4-19-79			
3. Time	09:50		11:45		12:20		15:10			
4. Load, 10^3 lb/hr	78		78		78		78			
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position	CENTER		CENTER		CENTER		center			
8. Oxygen (%)	9.8		10.0		9.6		10.6			
9. NOx (hot) read/3% O_2 (ppm)	162	262	*	-	*	-	*	-		
10. NO (hot) read/3% O_2 (ppm)	162	262	*	-	*	-	*	-		
11. NO_2 (hot) read/3% O_2 (ppm)	0	0	*	-	*	-	*	-		
12. NO (cold) read/3% O_2 (ppm)	170	275	135	221	145	229	140	243		
13. Carbon Dioxide (%)	9.0		7.7		7.7		6.8			
14. Carbon Monoxide (ppm) uncor/cor	305	493	195	319	195	308	140	243		
15. Hydrocarbon (ppm) uncor/cor	525	849	*	-	*	-	*	-		
16. Sulfur Dioxide (ppm) uncor/cor	920	1489	*	-	*	-	*	-		
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	67		75		76		80			
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.54		30.51		30.50		30.47			
21. Relative Humidity (%)										
22.										
23.										
24.										
25.	BASELINE TEST NORMAL OVER-FIRE AIR		NUMBER 5 DAMPER TO 50 %		NUMBER 6 & 7 DAMPERS TO 50%		NUMBER [illegible] TO 60% 5,6,7 AS BEFORE			
26.										
27.										
28.										
29.										
30.										

Data Sheet 6002-2

MOBILE LABORATORY DATA **Test No.**

Test No. **Date** 19 April 1979 **Location** 3 **Engr.** HB

Unit No. 5 **Fuel** COAL/WOOD **Capacity** 10^5 lb/hr

Unit Type **Burner Type** STOKER

1. Test No.	3-23									
2. Date	4-19-79									
3. Time	16:40									
• Load (steam, 10^3 lb/hr)	77									
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position	CENTER									
8. Oxygen (%)	9.9									
9. NOx (hot) read/3% O_2 (ppm)	*	-								
10. NO (hot) read/3% O_2 (ppm)	*	-								
11. NO_2 (hot) read/3% O_2 (ppm)	*	-								
12. NO (cold) read/3% O_2 (ppm)	135	218								
13. Carbon Dioxide (%)	9.5									
14. Carbon Monoxide (ppm) uncor/cor	95	154								
15. Hydrocarbon (ppm) uncor/cor	*	-								
16. Sulfur Dioxide (ppm) uncor/cor	*	-								
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	74									
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.46									
21. Relative Humidity (%)										
22.										
23.	DAMPERS TRIMMED AS BEFORE	LOWER UNDER-GRATE AIR								
24.										
25.										
26.										
27.										
28.										
29.										
30.										

MOBILE LABORATORY DATA

Test No.________

Test No.________ Date 20 April 1979 Location 3 Engr. HB

Unit No. 5 Fuel Coal/Bark Capacity 10^5 lb/hr

Unit Type________ Burner Type Stoker

1. Test No.	3-24		3-25							
2. Date	4-20-79		4-20-79							
3. Time	10:25		15:45							
4. Load (steam, 10^3 lb/hr)	77		65							
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position	CENTER		CENTER							
8. Oxygen (%)	9.9		8.8							
9. NOx (hot) read/3% O_2 (ppm)	*	-	*	-						
10. NO (hot) read/3% O_2 (ppm)	*	-	*	-						
11. NO_2 (hot) read/3% O_2 (ppm)	*	-	*	-						
12. NO (cold) read/3% O_2 (ppm)	137	222	114	168						
13. Carbon Dioxide (%)	8.9		10.2							
14. Carbon Monoxide (ppm) uncor/cor	180?	292	315	465						
15. Hydrocarbon (ppm) uncor/cor	*	-	*	-						
16. Sulfur Dioxide (ppm) uncor/cor	*	-	*	-						
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	68		64							
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.31		30.30							
21. Relative Humidity (%)										
22.										
23.										
24.										
25.										
26.	LOW NOx BRINK		LOW NOx SOx TEST							
27.										
28.										
29.										
30.										

Data Sheet 6002-2

MOBILE LABORATORY DATA Test No.

Test No. Date 4-23-79 Location 3 Engr. HB

Unit No. 5 Fuel Coal/Bark Capacity 10^5 lb/hr

Unit Type Burner Type stoker

1. Test No.	3-26		3-26		3-26					
2. Date	4-23-79		4-23-79		4-23-79					
3. Time	11:30		12:05		12:35					
4. Load (Steam flow, 10^3 lb/hr)	82		82		82					
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position	CENTER		CENTER		CENTER					
8. Oxygen (%)	8.3		8.3		7.9					
9. NOx (hot) read/3% O_2 (ppm)	*	-	*	-	*	-				
10. NO (hot) read/3% O_2 (ppm)	*	-	*	-	*	-				
11. NO_2 (hot) read/3% O_2 (ppm)	*	-	*	-	*	-				
12. NO (cold) read/3% O_2 (ppm)	150	213	145	206	148	204				
13. Carbon Dioxide (%)	9.9		9.9		10.7					
14. Carbon Monoxide (ppm) uncor/cor	185	262	140	198	85	117				
15. Hydrocarbon (ppm) uncor/cor	*	-	*	-	*	-				
16. Sulfur Dioxide (ppm) uncor/cor	*	-	*	-	*	-				
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	69/21		73/23		74/23					
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.50		30.49		30.49					
21. Relative Humidity (%)										
22.										
23.										
24.										
25.	LOW NOx PARTICULATE TEST									
26.		→	→		→					
27.										
28.										
29.		→	→		→					
30.										

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.________

Test No.__________ Date 24 April 79 Location 3 Engr. 4B/GO

Unit No. 5 Fuel Coal/Bark Capacity 10^5 lb/hr

Unit Type__________ Burner Type Stoker

1. Test No.	3-27		3-27		3-27		3-28			
2. Date	4-24		4-24		4-24		4-24			
3. Time	9:50		11:00		11:30		14:30			
4. Load (steam, 10^3 lb/hr)	82		82		85		84			
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position	CENTER		CENTER		CENTER		CENTER			
8. Oxygen (%)	9.8		9.5		9.6		9.4			
9. NOx (hot) read/3% O_2 (ppm)	*	-	*	-	*	-	*	-		
10. NO (hot) read/3% O_2 (ppm)	*	-	*	-	*	-	*	-		
11. NO_2 (hot) read/3% O_2 (ppm)	*	-	*	-	*	-	*	-		
12. NO (cold) read/3% O_2 (ppm)	125	200	145	227	133	210	115	178		
13. Carbon Dioxide (%)	9.9		9.5		9.9		10.2			
14. Carbon Monoxide (ppm) uncor/cor	305	488	240	376	195	309	305	472		
15. Hydrocarbon (ppm) uncor/cor	*	-	*	-	*	-	*	-		
16. Sulfur Dioxide (ppm) uncor/cor	*	-	*	-	*	-	*	-		
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	73 / 23		74/ 23		74		75			
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.31		30.30		30.30		30.24			
21. Relative Humidity (%)										
22.	BASELINE PARTICULATE HIGH BARK FLOW)		BASELINE PARTICULATE HIGH BARK FLOW)		BASELINE PARTICULATE HIGH BARK FLOW)		BASELINE BRINK HIGH BARK FLOW)			
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.________

Test No.________ Date 25 April 1979 Location 3 Engr. HE CC

Unit No. 5 Fuel Coal/Bark Capacity 10^5 lb/hr

Unit Type________ Burner Type Stoker

1. Test No.	3-29		3-30		3-31		3-32			
2. Date	4-25		4-25		4-25		4-25			
3. Time	09:10		09:40		10:48		11:34			
4. Load (steam, 10^3 lb/hr)	40		60		81		103			
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position	CENTER		CENTER		CENTER		CENTER			
8. Oxygen (%)	11.9		10.8		9.3		9.1			
9. NOx (hot) read/3% O_2 (ppm)*	⬡	-	⬡	-	⬡	-	⬡	-		
10. NO (hot) read/3% O_2 (ppm)*	⬡	-	⬡	-	⬡	-	⬡	-		
11. NO_2 (hot) read/3% O_2 (ppm)*	⬡	-	⬡	-	⬡	-	⬡	-		
12. NO (cold) read/3% O_2 (ppm)*	104	205	122	214	144	221	177	268		
13. Carbon Dioxide (%)	7.5		8.6		9.5		9.9			
14. Carbon Monoxide (ppm) uncor/cor*	420	828	160	281	150	230	240	364		
15. Hydrocarbon (ppm) uncor/cor*	⬡	-	⬡	-	⬡	-	⬡	-		
16. Sulfur Dioxide (ppm) uncor/cor*	⬡	-	⬡	-	⬡	-	⬡	-		
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	67/		71		71		69			
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.98		30.01		29.91		29.91			
21. Relative Humidity (%)										
22.										
23. LOAD VARIATION WITH NOMINAL O_2							VERY SENSITIVE TO O_2 VARIATIONS AT THIS LOAD			
24. TO DETERMINE NO VS. LOAD										
25. CHARACTERISTICS OF THIS UNIT										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

KVB, INC.

ENGINEER *K.*

CONTROL ROOM DATA SHEET

Location: 3 FUEL: Coal and Bark

Test No.	3-1	3-2	3-3	3-4
Date	4-11-79	4-11-79	4-11-79	4-11-79
Time	14:45	16:04	16:50	17:37
Load (lb/hr) x10³	82	83	82	52
Stream Flow Integr. x 1250	16:51 366439	366514	366562	366615
Air Flow	86	96	72	63
F.W. Flow/Temp. (lb/hr/ °F)	90 / 265	85 / 365	90 / 365	90 / 265
Air Temp. Entering A.H. (°F)	85	88	90	90
Air Temp. Leaving A.H. (°F)	420	410	430	450
Gas Temp. Entering A.H. (°F)	565	580	570	560
Gas Temp. Leaving A.H. (°F)	420	430	430	440
F.W. Press. (psig)	1020	1020	1020	1020
Steam Header Press. (psig)	572	580	581	578
S.H. Metal Temp. (°F)	759	747	783	785
Steam Temp (°F)	785	780	800	810
F.D. Fan Press. (in. H_2O)	2.6	2.7	1.9	1.6
A.H. Outlet Press. (in. H_2O)	2.0	2.2	1.5	1.2
Plenum Press. (in. H_2O)	1.0	1.0	.6	.6
Overfire Air Press. (in. H_2O)	19	14	19	19
Furnace Draft (in. H_2O)	-.1	-.1	-.1	-.00
Blr. Outlet Draft (in. H_2O)	-1.0	-1.0	-.9	-.9
A.H. Outlet Draft (in. H_2O)	-2.5	-2.4	-2.3	-2.2
Classifier Outlet (in. H_2O)	-2.8	-2.6	-2.5	-2.4
Dust Collector Outlet (in. H_2O)	0.05	005	005	005
ID Fan Inlet (in. H_2O)	-11.0	-12.0	-11.0	-10.5
Bark Distrib. Air (in. H_2O)	9.0	+9.0	9.0	9.0
	Baseline	Hi O2	Lo O2	Lowest O2 Light Haze

(Continued)

Data Sheet
6015
4/4/79

(Continued)

Test No.	3-1	3-2	3-3	3-4
Date	4-11-79	4-11-79	4-11-79	4-11-79
Time	14:45	16:04	16:50	17:37
East Grate Temp. (°F)	005	005	005	005
West Grate Temp. (°F)	005	005	005	005
Fuel Flow (Time/lbs)	2142 | 14:48	2187 | 16:16	2202 | 16:59	2223 | 17:49
Bark Screw (% max RPM)	22	22	22	22
Excess Air Setpoint	41	31	46	52
Furnace Draft Setpoint	58	58	58	58
Stoker Rotor Contr. Setpoint	100	82	65	60
Opacity (0-100%) Not calibr.	40	40	38	70
Grate Speed (indic.)	2.9 Fast	2.9 Fast	1.3 Fast	1.3 Fast
Spill Plate Setting	—	—	—	—
Overfire Air Damper (% Open)	100	100	100	100
Contr Room O_2 (%)	8	>10	6.8	5.9

Center of Furnace bright
(Bark). Sides fairly out
some [illegible]

Data Sheet
6015
4/4/79

KVB, INC.

ENGINEER LSa.

CONTROL ROOM DATA SHEET

Location: 3 FUEL: Coal and Bark

Test No.	3-5			
Date	4-12			
Time	10:21			
Load (lb/hr) x10^3	35			
Stream Flow Integr. x 1250	367483			
Air Flow	40			
F.W. Flow/Temp. (lb/hr/ °F)	45 / 256			
Air Temp. Entering A.H. (°F)	95			
Air Temp. Leaving A.H. (°F)	450			
Gas Temp. Entering A.H. (°F)	540			
Gas Temp. Leaving A.H. (°F)	420			
Contl Room O. %	7.10			
F.W. Press. (psig)	1030			
Steam Header Press. (psig)	581			
S.H. Metal Temp. (°F)	771			
Steam Temp.				
F.D. Fan Press. (in. H_2O)	.6			
A.H. Outlet Press. (in. H_2O)	.5			
Plenum Press. (in. H_2O)	.3			
Overfire Air Press. (in. H_2O)	20.5			
Furnace Draft (in. H_2O)	-.2			
Blr. Outlet Draft (in. H_2O)	-.75			
A.H. Outlet Draft (in. H_2O)	-1.2			
Classifier Outlet (in. H_2O)	-1.2			
Dust Collector Outlet (in. H_2O)	005			
ID Fan Inlet (in. H_2O)	11.5			
Bark Distrib. Air (in. H_2O)	9			

Low Load
~50% Bark

(Continued)

Data Sheet
6015
4/4/79

(Continued)

Test No.	3-5			
Date	4-12-79			
Time	10:21			
East Grate Temp. (°F)	005			
West Grate Temp. (°F)	005			
Fuel Flow (Time/lbs)	10:42 3590			
Bark Screw (% max RPM)	20			
Excess Air Setpoint	39			
Furnace Draft Setpoint	57			
Stoker Rotor Contr. Setpoint	29			
Opacity (0-100%)	34			
Grate Speed (indic.)	2.5 Fast			
Spill Plate Setting	—			
Overfire Air Damper (% Open)	48			

KVB, INC.

ENGINEER

CONTROL ROOM DATA SHEET

Location: 3 FUEL: Coal and Bark

Test No.	3-6	3-6	3-6	
Date	4-13-79	4-13-79	4-13-79	
Time	11:16	18:57	14:10	
Load (lb/hr) $\times 10^3$	80	80	80	
Stream Flow Integr. x 1250	368784	368869	368966	
Air Flow %	67	67	67	
F.W. Flow/Temp. (lb/hr/ °F)	87 / 256	87 / 256	87 / 256	
Air Temp. Entering A.H. (°F)	88	89	90	
Air Temp. Leaving A.H. (°F)	420	434	440	
Gas Temp. Entering A.H. (°F)	565	570	580	
Gas Temp. Leaving A.H. (°F)	415	424	440	
C R O_2 (%)	9.0	7.5	7.6	
F.W. Press. (psig)	1030	1030	1030	
Steam Header Press. (psig)	585	572	580	
S.H. Metal Temp. (°F)	723	777	765	
S H Steam Temp (°F)	750	803	795	
F.D. Fan Press. (in. H_2O)	2.0	2.0	2.0	
A.H. Outlet Press. (in. H_2O)	1.6	1.5	1.5	
Plenum Press. (in. H_2O)	.8	.8	.75	
Overfire Air Press. (in. H_2O)	19	19	19	
Furnace Draft (in. H_2O)	-.13	-.14	-.12	
Blr. Outlet Draft (in. H_2O)	-.9	-.9	-.9	
A.H. Outlet Draft (in. H_2O)	-2.0	-2.2	-2.5	
Classifier Outlet (in. H_2O)	-2.4	-2.5	-3.1	
Dust Collector Outlet (in. H_2O)	-5.9	-6.3	-7.1	
ID Fan Inlet (in. H_2O)	-11.0	-11.0	-11.0	
Bark Distrib. Air (in. H_2O)	9-10	9-11	7-11	
	Baseline Part. ~22% Bark	Baseline Part. ~31% Bark High Bark Flow	H. Bark Baseline Part. ~30% Bark	

(Continued)

Data Sheet
6015
4/4/79

(Continued)

Test No.	3-6	3-6	3-6	
Date	4-13-79	4-13-79	4-13-79	
Time	11:16	12:57	14:10	
East Grate Temp. (°F)	—	—	—	
West Grate Temp. (°F)	—	—	—	
Fuel Flow (Time/lbs)	11:21 | 3197	13:06 | 3248	14:19 | 3283	
Bark Screw (% max RPM)	21	22	22	
Excess Air Setpoint	43	44	44	
Furnace Draft Setpoint	59	59	59	
Stoker Rotor Contr. Setpoint	90	60	62	
Opacity (0-100%)	24÷42	35÷53	34÷68	
Grate Speed (indic.)	5.5 Fast	5.5 Fast	5.5 Fast	
Spill Plate Setting	—	—	—	
Overfire Air Damper (% Open)	96	100	95	

Data Sheet
6015
4/4/79

KVB, INC.

ENGINEER

CONTROL ROOM DATA SHEET

Location: 3　　FUEL: Coal and Bark

Test No.	3-7	3-8	3-9	3-10
Date	4-16-79	4-16-79	4-16-79	4-16-79
Time	10:50	11:30	11:55	16:01
Load (lb/hr) x10³	55.0	53.0	55.0	57.0
Stream Flow Integr. x 1250	369316	369346	369362	369551
Air Flow %	56	53	52	55
F.W. Flow/Temp. (lb/hr/ °F)	60 / 256	65 / 256	70 / 256	85 / 256
Air Temp. Entering A.H. (°F)	88	86	84	79
Air Temp. Leaving A.H. (°F)	443	435	421	445
Gas Temp. Entering A.H. (°F)	551	535	535	555
Gas Temp. Leaving A.H. (°F)	431	417	408	435
[illegible]	8.0	8.8	9.5	8.0
F.W. Press. (psig)	970	970	970	960
Steam Header Press. (psig)	590	590	600	600
S.H. Metal Temp. (°F)	805	748	731	810
SH Temp °F	810	781	760	825
F.D. Fan Press. (in. H_2O)	1.2	1.0	1.1	1.5
A.H. Outlet Press. (in. H_2O)	.8	.8	.9	1.1
Plenum Press. (in. H_2O)	.5	.4	.45	.5
Overfire Air Press. (in. H_2O)	15	15	15	15
Furnace Draft (in. H_2O)	-.12	-.13	-.12	-.12
Blr. Outlet Draft (in. H_2O)	-.5	-.7	-.8	-.9
A.H. Outlet Draft (in. H_2O)	-20	-1.9	-1.8	-2.1
Classifier Outlet (in. H_2O)	-23	-2.1	-1.8	-2.5
Dust Collector Outlet (in. H_2O)	-60	-4.8	-4.5	-6.0
ID Fan Inlet (in. H_2O)	-11.6	-11.0	-11.5	-11
Bark Distrib. Air (in. H_2O)	8.0	8.0	8.0	8.0
	Med. Load ~23% Barkflow	Med. Load ~23% Barkflow	No Bark Coal Only	24% Bark

(Continued)

Data Sheet
6015
4/4/79

(Continued)

Test No.	3-7	3-8	3-9	3-10
Date	4-16-79	4-16-79	4-16-79	4-16-79
Time	10:50	11:30	11:55	16:01
East Grate Temp. (°F)	–	–	–	–
West Grate Temp. (°F)	–	–	–	–
Fuel Flow (Time/lbs)	11:02 | 3572	11:36 | 3582	12:00 | 3592	16:06 | 3665
Bark Screw (% max RPM)	19	19	19	21
Excess Air Setpoint	43	43	43	41
Furnace Draft Setpoint	59	59	59	59
Stoker Rotor Contr. Setpoint	22	26	44	5
Opacity (0-100%)	40 ÷ 51	32 ÷ 41	30	38 · 43
Grate Speed (indic.)	3.8 Fast	3.8 Fast	3.8 Fast	3.2 Fast
Spill Plate Setting	–	–	–	–
Overfire Air Damper (% Open)	100	100	100	100

Data Sheet
6015
4/4/79

KVB, INC.

ENGINEER B.

CONTROL ROOM DATA SHEET

Location: 3

FUEL: Coal and Bark

Test No.	3-11	3-12	3-13	3-14
Date	4-17-79	4-17-79	4-17-79	4-17-79
Time	9:50	10:28	11:10	12:07
Load (lb/hr) $\times 10^3$	78	78	78	78
Stream Flow Integr. x 1250	370523	370561	370606	370663
Air Flow	70	77	77	64
F.W. Flow/Temp. (lb/hr/ °F)	84 / 256	85 / 256	90 / 256	87 / 256
Air Temp. Entering A.H. (°F)	80	80	79	78
Air Temp. Leaving A.H. (°F)	430	420	408	412
Gas Temp. Entering A.H. (°F)	562	567	560	550
Gas Temp. Leaving A.H. (°F)	430	428	417	410
C R. O_2 %	7.6	9.0	9.4	7.9
F.W. Press. (psig)	930	1000	1010	1005
Steam Header Press. (psig)	600	595	600	595
S.H. Metal Temp. (°F)	800	784	748	734
S.H Temp °F	800	791	765	750
F.D. Fan Press. (in. H_2O)	1.8	2.1	2.4	1.7
A.H. Outlet Press. (in. H_2O)	1.4	1.6	1.9	1.4
Plenum Press. (in. H_2O)	.7	.8	.95	.7
Overfire Air Press. (in. H_2O)	15	15	15	15
Furnace Draft (in. H_2O)	-.25	-.27	-.08	-.07
Blr. Outlet Draft (in. H_2O)	-.9	-1.0	-.85	-.8
A.H. Outlet Draft (in. H_2O)	-2.5	-2.5	-2.2	-1.8
Classifier Outlet (in. H_2O)	-3	-3	-2.6	-2.1
Dust Collector Outlet (in. H_2O)	-7	-7.5	-6.4	-5.0
ID Fan Inlet (in. H_2O)	-11.0	-11.0	-11.0	-11.0
Bark Distrib. Air (in. H_2O)	8.0	8.0	8.0	8.0
	Baseline Low Bark flow ~15% Bark	High Air Low Bark ~15% Bark	Coal Only High Air	Coal Only Normal Air

(Continued)

Data Sheet
6015
4/4/79

(Continued)

Test No.	3-11	3-12	3-13	3-14
Date	4-17-79	4-17-79	4-17-79	4-17-79
Time	9:50	10:28	11:10	12:07
East Grate Temp. (°F)	—	—	—	—
West Grate Temp. (°F)	—	—	—	—
Fuel Flow (Time/lbs)	9:59 | 4012	10:41 | 4035	11:17 | 4058	12:14 | 4097
Bark Screw (% max RPM)	11	11	0	0
Excess Air Setpoint	44	40	40	48
Furnace Draft Setpoint	56	56	60	60
Stoker Rotor Contr. Setpoint	39	39	59	62
Opacity (0-100%)	35 ÷ 42	52 ÷ 58	31 ÷ 40	29 ÷ 39
Grate Speed (indic.)	3.6 Fast	3.6 Fast	3.6 Fast	3.6 Fast
Spill Plate Setting	—	—	—	—
Overfire Air Damper (% Open)	100	100	100	100

Data Sheet
6015
4/4/79

KVB, INC.

ENGINEER

CONTROL ROOM DATA SHEET

Location: 3 FUEL: Coal and Bark

Test No.	3-15	3-15	3-15	
Date	4-18-79	4-18-79	4-18-79	
Time	10:12	10:50	11:45	
Load (lb/hr) x 10³	78	78	78	
Stream Flow Integr. x 1250	371779	371819	371874	
Air Flow	75	75	75	
F.W. Flow/Temp. (lb/hr/ °F)	85 | 256	85 | 256	85 | 256	
Air Temp. Entering A.H. (°F)	80	80	80	
Air Temp. Leaving A.H. (°F)	419	419	425	
Gas Temp. Entering A.H. (°F)	565	565	570	
Gas Temp. Leaving A.H. (°F)	427	428	430	
C.R. O_2 %	7.8	8.1	7.8	
F.W. Press. (psig)	1030	1030	1030	
Steam Header Press. (psig)	585	600	590	
S.H. Metal Temp. (°F)	789	790	784	
S.H Temp. °F	781	785	785	
F.D. Fan Press. (in. H_2O)	2.0	2.0	2.0	
A.H. Outlet Press. (in. H_2O)	1.6	1.6	1.6	
Plenum Press. (in. H_2O)	.75	.8	.8	
Overfire Air Press. (in. H_2O)	15	15	15	
Furnace Draft (in. H_2O)	-.15	-.15	-.02 ÷ .26	
Blr. Outlet Draft (in. H_2O)	-.8	-.7	-.8	
A.H. Outlet Draft (in. H_2O)	-2.5	-2.2	-2.2	
Classifier Outlet (in. H_2O)	-2.8	-2.6	-2.9	
Dust Collector Outlet (in. H_2O)	-6.5	-7.0	-6.8	
ID Fan Inlet (in. H_2O)	-11.0	-11.0	-11.0	
Bark Distrib. Air (in. H_2O)	8.0	8.0	8.0	
	82-70	73-64	78-67	
	Baseline Particulate 15% Bark	Baseline Particulate 18% Bark	Baseline Particulate 14% Bark	

(Continued)

Data Sheet
6015
4/4/79

(Continued)

Test No.	3-15	3-15	3-15	
Date	4·18·79	4·18-79	4-18·79	
Time	10:12	10:50	11:45	
East Grate Temp. (°F)	—	-	—	
West Grate Temp. (°F)	—	-	—	
Fuel Flow (Time/lbs)	10:21 | 4877	10:58 | 4897	11:51 | 4927	
Bark Screw (% max RPM)	11	10	10	
Excess Air Setpoint	42	42	42	
Furnace Draft Setpoint	56	56	56	
Stoker Rotor Contr. Setpoint	29	26	40	
Opacity (0-100%)	38 ÷ 44	40 ÷ 45	40 ÷ 44	
Grate Speed (indic.)	2.6 Fast	2.6 Fast	3.8 Fast	
Spill Plate Setting	—	—	—	
Overfire Air Damper (% Open)	100	100	100	
TOTAL STEAM FLOW	282	300	285	
UNIT 6 STEAM FLOW	63	75	70	

KVB, INC.

ENGINEER Km

CONTROL ROOM DATA SHEET

Location: 3

FUEL: Coal and Bark

Test No.	3-16	3-17	3-18	
Date	4-18-79	4-18-79	4-18-79	
Time	14:20	15:32	16:10	
Load (lb/hr) x 10^3	78	80	78	
Stream Flow Integr. x 1250	372027	372101	372138	
Air Flow	74	67	64	
F.W. Flow/Temp. (lb/hr/ °F)	85 / 256	90 / 256	120 / 256	
Air Temp. Entering A.H. (°F)	83	86	85	
Air Temp. Leaving A.H. (°F)	425	431	440	
Gas Temp. Entering A.H. (°F)	571	568	575	
Gas Temp. Leaving A.H. (°F)	425	431	435	
C.R. O_2 %	8.5	7.5	6.7	
F.W. Press. (psig)	1030	1030	1030	
Steam Header Press. (psig)	590	590	580	
S.H. Metal Temp. (°F)	787	776	782	
S.H. Temp °F	790	780	792	
F.D. Fan Press. (in. H_2O)	2.1	1.9	1.5	
A.H. Outlet Press. (in. H_2O)	1.5	1.3	1.3	
Plenum Press. (in. H_2O)	.75	.5	.5	
Overfire Air Press. (in. H_2O)	15	15	15	
Furnace Draft (in. H_2O)	-.65 ÷ -.22	-.01 ÷ -.25	-.1 ÷ -.24	
Blr. Outlet Draft (in. H_2O)	-.85	-.9	-.75	
A.H. Outlet Draft (in. H_2O)	-2.5	-2.2	-2.0	
Classifier Outlet (in. H_2O)	-2.9	-2.7	-2.5	
Dust Collector Outlet (in. H_2O)	-6.5	-6.4	-6.0	
ID Fan Inlet (in. H_2O)	-11	-11	-11	
Bark Distrib. Air (in. H_2O)	8.0	8.0	8.0	
	80-69 High O_2 14% Bark	78-73 Baseline O_2 Swing 6% Bark	O_2 Swing 6% Bark	

(Continued)

Data Sheet
6015
4/4/79

(Continued)

Test No.	3-16	3-17	3-18	
Date	4-18-79	4-18-79	4-18-79	
Time	14:20	15:32	16:10	
East Grate Temp. (°F)	—	—	—	
West Grate Temp. (°F)	—	—	—	
Fuel Flow (Time/lbs)	14:27 | 5007	15:38 | 5049	16:14 | 5072	
Bark Screw (% max RPM)	10	10	10	
Excess Air Setpoint	41	46	50	
Furnace Draft Setpoint	56	56	56	
Stoker Rotor Contr. Setpoint	34	39	50	
Opacity (0-100%)	40 ÷ 48	36 ÷ 50	48 ÷ 75	
Grate Speed (indic.)	4 Fast	3 Fast	4 fast	
Spill Plate Setting	—	—	—	
Overfire Air Damper (% Open)	100	100	100	
TOTAL STEAM FLOW 10^3 lb/hr	300	308	290	
UNIT 6 STEAM FLOW 10^3 lb/hr	75	70	72	

Data Sheet
6015
4/4/79

KVB, INC.

ENGINEER

CONTROL ROOM DATA SHEET

Location:

FUEL: Coal and Bark

Test No.	3-19	3-20	3-21	3-22
Date	4-19-79	4-19-79	4-19-79	4-19-79
Time	9:45	11:35	12:43	15:08
Load (lb/hr) x10³	78	78	78	78
Stream Flow Integr. x 1250	372973	373084	373147	373296
Air Flow	72	73	72	72
F.W. Flow/Temp. (lb/hr/ °F)	85/256	85/256	85/256	85/256
Air Temp. Entering A.H. (°F)	80	80	80	88
Air Temp. Leaving A.H. (°F)	425	430	430	430
Gas Temp. Entering A.H. (°F)	569	570	570	569
Gas Temp. Leaving A.H. (°F)	431	432	435	431
C R O_2	8.5	8.5	8.5	8.8
F.W. Press. (psig)	1025	1030	1030	1030
Steam Header Press. (psig)	590	585	590	580
S.H. Metal Temp. (°F)	780	753	775	753
S H Temp °F	782	790	795	795
F.D. Fan Press. (in. H_2O)	2.0	1.9	1.9	1.9
A.H. Outlet Press. (in. H_2O)	1.5	1.5	1.5	1.4
Plenum Press. (in. H_2O)	.8	.8	.8	.6
Overfire Air Press. (in. H_2O)	15	15.5	15.5	15.6
Furnace Draft (in. H_2O)	-.35 ÷ -.1	-.3 ÷ -.1	-.3 ÷ -.15	-.32 ÷ -.15
Blr. Outlet Draft (in. H_2O)	-.9	-.9	-.9	-.9
A.H. Outlet Draft (in. H_2O)	-2.6	-2.5	-2.5	-2.5
Classifier Outlet (in. H_2O)	-2.6	-2.6	-2.6	-2.6
Dust Collector Outlet (in. H_2O)	-7.0	-7.0	-7.0	-7.0
ID Fan Inlet (in. H_2O)	-10.5	-10.5	-10.5	-10.5
Bark Distrib. Air (in. H_2O)	8.0	8.0	8.0	8.0

Baseline

Overfire Air Adjustment See Logbook

78-66
15% Bark

(Continued)

Data Sheet
6015
4/4/79

(Continued)

Test No.	3-19	3-~~19~~ 20	3-~~20~~ 21	3-22
Date	4-19-79	4-19-79	4-19-79	4-19-79
Time	9:45	11:35	12:43	15:08
East Grate Temp. (°F)	—	—	—	—
West Grate Temp. (°F)	—	—	—	—
Fuel Flow (Time/lbs)	5465 | 9:50	11:49 | 5514	12:54 | 5543	15:10 | 5610
Bark Screw (% max RPM)	16	18	16	16
Excess Air Setpoint	43	43	43	43
Furnace Draft Setpoint	55	55	55	55
Stoker Rotor Contr. Setpoint	30	44	45	
Opacity (0-100%)	44 - 51	42 - 51	44 - 51	38 - 44
Grate Speed (indic.)	4.5 Fast	4.4 Fast	4.4 Fast	3.5 Fast
Spill Plate Setting	—	—	—	—
Overfire Air Damper (% Open)	100	100	100	100
TOTAL STEAM FLOW 10^3 lb/hr	310	320	320	315
UNIT 6 " " — " —	80	95	75	80

Data Sheet
6015
4/4/79

KVB, INC.

ENGINEER

CONTROL ROOM DATA SHEET

Location: 3

FUEL: Coal and Bark

Test No.	3-23			
Date	4-19-79			
Time	16:24			
Load (lb/hr) x10^3	77			
Stream Flow Integr. x 1250	373373			
Air Flow	62			
F.W. Flow/Temp. (lb/hr/ °F)	85 / 256			
Air Temp. Entering A.H. (°F)	58			
Air Temp. Leaving A.H. (°F)	438			
Gas Temp. Entering A.H. (°F)	509			
Gas Temp. Leaving A.H. (°F)	429			
EP O_2 %	5.0			
F.W. Press. (psig)	1030			
Steam Header Press. (psig)	580			
S.H. Metal Temp. (°F)	760			
SH Temp °F	785			
F.D. Fan Press. (in. H_2O)	13			
A.H. Outlet Press. (in. H_2O)	1.1			
Plenum Press. (in. H_2O)	45			
Overfire Air Press. (in. H_2O)	15.5			
Furnace Draft (in. H_2O)	-.3 ÷ -.2			
Blr. Outlet Draft (in. H_2O)	-.85			
A.H. Outlet Draft (in. H_2O)	-1.9			
Classifier Outlet (in. H_2O)	-2.1			
Dust Collector Outlet (in. H_2O)	-6.0			
ID Fan Inlet (in. H_2O)	-11.0			
Bark Distrib. Air (in. H_2O)	50			

Low NO_x
15% Bark

(Continued)

Data Sheet
6015
4/4/79

(Continued)

Test No.	3-23			
Date	4-19-79			
Time	16:24			
East Grate Temp. (°F)	–			
West Grate Temp. (°F)	–			
Fuel Flow (Time/lbs)	16:34 | 5648			
Bark Screw (% max RPM)	16			
Excess Air Setpoint	50			
Furnace Draft Setpoint	55			
Stoker Rotor Contr. Setpoint	59			
Opacity (0-100%)	32 – 46			
Grate Speed (indic.)	3.5 Fast			
Spill Plate Setting	–			
Overfire Air Damper (% Open)	100			
TOTAL STEAM FLOW, 10^3 lb/hr	290			
UNIT 6 " " "	75			

Data Sheet
6015
4/4/79

KVB, INC.

ENGINEER B.

CONTROL ROOM DATA SHEET

Location: 3 FUEL: Coal and Bark

Test No.	3-24	3-25		
Date	4-20-79	-20-79		
Time	11:52	15:37		
Load (lb/hr) x 10^3	77	65		
Stream Flow Integr. x 1250	374375	374585		
Air Flow	66	47		
F.W. Flow/Temp. (lb/hr/ °F)	85 / 256	95 / 256		
Air Temp. Entering A.H. (°F)	85	85		
Air Temp. Leaving A.H. (°F)	430	450		
Gas Temp. Entering A.H. (°F)	565	560		
Gas Temp. Leaving A.H. (°F)	430	440		
C.R. O_2 %	8.0	8.5		
F.W. Press. (psig)	1030	1035		
Steam Header Press. (psig)	595	595		
S.H. Metal Temp. (°F)	747	803		
SH Temp. °F	782	831		
F.D. Fan Press. (in. H_2O)	2.0	1.5		
A.H. Outlet Press. (in. H_2O)	1.4	1.2		
Plenum Press. (in. H_2O)	.7	.45		
Overfire Air Press. (in. H_2O)	15.5	15.5		
Furnace Draft (in. H_2O)	-.3 ÷ -.1	-.15		
Blr. Outlet Draft (in. H_2O)	-.8	-.8		
A.H. Outlet Draft (in. H_2O)	-2.4	-2.2		
Classifier Outlet (in. H_2O)	-2.3	-2.3		
Dust Collector Outlet (in. H_2O)	-6.0	-6.0		
ID Fan Inlet (in. H_2O)	-11	-10.5		
Bark Distrib. Air (in. H_2O)	8.0	8.0		
	83-65	70-52		
	Low NO_x Brink 21% Bark	SO_x 26% Bark		

(Continued)

Data Sheet
6015
4/4/79

(Continued)

Test No.	3-24	3-25		
Date	4-20-79	4-20-79		
Time	11:52	15:37		
East Grate Temp. (°F)	–	–		
West Grate Temp. (°F)	–	–		
Fuel Flow (Time/lbs)	12:11 | 6117	15:50 | 6197		
Bark Screw (% max RPM)	21	21		
Excess Air Setpoint	46	47		
Furnace Draft Setpoint	55	56		
Stoker Rotor Contr. Setpoint	33	49		
Opacity (0-100%)	37 - 50	38 - 46		
Grate Speed (indic.)	3.7 Fast	5.0 Fast		
Spill Plate Setting	–	–		
Overfire Air Damper (% Open)	100	100		
TOTAL STEAM FLOW 10^3 lb/hr	280	250		
UNIT 6 " " "	60	40		

Data Sheet
6015
4/4/79

KVB, INC.

ENGINEER K.

CONTROL ROOM DATA SHEET

Location: 3 FUEL: Coal and Bark

Test No.	3-26	3-26	3-26	
Date	4-23-79	4-23-79	4-23-79	
Time	11:20	12:15	12:45	
Load (lb/hr) ×10³	82	82	82	
Stream Flow Integr. x 1250	378013	378074	378109	
Air Flow	65	66	66	
F.W. Flow/Temp. (lb/hr/ °F)	85 / 256	87 / 256	85 / 256	
Air Temp. Entering A.H. (°F)	58	88	89	
Air Temp. Leaving A.H. (°F)	447	435	446	
Gas Temp. Entering A.H. (°F)	571	565	565	
Gas Temp. Leaving A.H. (°F)	442	435	435	
[illegible] O_2 %	7.3	7.4	7.0	
F.W. Press. (psig)	1630	1630	1625	
Steam Header Press. (psig)	580	580	580	
S.H. Metal Temp. (°F) TC 2	779	792	804	
SH Temp. °F	830	810	832	
F.D. Fan Press. (in. H_2O)	1.8	1.85	1.85	
A.H. Outlet Press. (in. H_2O)	1.3	1.4	1.3	
Plenum Press. (in. H_2O)	.5	.65	.6	
Overfire Air Press. (in. H_2O)	17	17	17	
Furnace Draft (in. H_2O)	-.1	-.13	-.14	
Blr. Outlet Draft (in. H_2O)	-.7	-.7	-.8	
A.H. Outlet Draft (in. H_2O)	-2.2	-2.3	-2.2	
Classifier Outlet (in. H_2O)	-2.3	-2.3	-2.2	
Dust Collector Outlet (in. H_2O)	7.6	-6.4	-6.3	
ID Fan Inlet (in. H_2O)	10.5	-10.5	-10.5	
Bark Distrib. Air (in. H_2O)	5.0	5.0	5.0	
	Low NO_x Partic. ~16% Bark	Low NO_x Partic. 16% Bark	Low NO_x Part. 16% Bark	

(Continued)

Data Sheet
6015
4/4/79

(Continued)

Test No.	3-26	3-26	3-26	
Date	4-23-79	4-23-79	4-23-79	
Time	11:20	12:15	12:45	
East Grate Temp. (°F)	—	—	—	
West Grate Temp. (°F)	—	—	—	
Fuel Flow (Time/lbs)	11:28 / 7934	12:21 / 7955	13:04 / 7970	
Bark Screw (% max RPM)	22	22	22	
Excess Air Setpoint	50	50	50	
Furnace Draft Setpoint	57	57	57	
Stoker Rotor Contr. Setpoint	14	35	22	
Opacity (0-100%)	38 - 45	36 - 42	38 - 41	
Grate Speed (indic.)	3 Fast	3 Fast	3 Fast	
Spill Plate Setting	—	—	—	
Overfire Air Damper (% Open)	100	100	100	
TOTAL STEAM FLOW, 10^3 lb/hr	310	300	300	
UNIT 6 " " "	79	66	64	

No clinkers observed
Different coal?

KVB, INC.

ENGINEER

CONTROL ROOM DATA SHEET

Location: 3

FUEL: Coal and Bark

Test No.	3-27	3-27	3-27	3-28
Date	4-24-79	4-24-79	4-24-79	4-24-79
Time	10:00	11:09	11:40	14:34
Load (lb/hr) x10³	82	83	85	84
Stream Flow Integr. x 1250	379306	379376	379410	379600
Air Flow	75	75	77	76
F.W. Flow/Temp. (lb/hr/ °F)	90 | 256	92 | 256	95 | 256	95 | 256
Air Temp. Entering A.H. (°F)	88	90	89	90
Air Temp. Leaving A.H. (°F)	435	425	440	440
Gas Temp. Entering A.H. (°F)	579	575	579	572
Gas Temp. Leaving A.H. (°F)	440	435	430	440
C R O_2 %	7.6	8.0	7.5	7.8
F.W. Press. (psig)	1035	1030	1030	1030
Steam Header Press. (psig)	585	590	580	590
S.H. Metal Temp. (°F)	789	769	778	802
S.H. Steam Temp °F	508	795	803	835
F.D. Fan Press. (in. H_2O)	2.3	2.2	2.3	2.4
A.H. Outlet Press. (in. H_2O)	1.5	1.6	1.7	1.7
Plenum Press. (in. H_2O)	1.0	1.0	1.0	.95
Overfire Air Press. (in. H_2O)	14.0	14	14	14
Furnace Draft (in. H_2O)	-.15	0 ÷ -.21	-.09 ÷ -.8	-.1 ÷ -.2
Blr. Outlet Draft (in. H_2O)	1.0	-.9	-.9	-.9
A.H. Outlet Draft (in. H_2O)	-2.0	-2.2	-2.6	-5.3
Classifier Outlet (in. H_2O)	-2.8	-2.4	-2.4	-3.0
Dust Collector Outlet (in. H_2O)	-7.5	-7.5	-7.0	-8.0
ID Fan Inlet (in. H_2O)	-11.0	-11.0	-11.0	-11.0
Bark Distrib. Air (in. H_2O)	9.0	9.0	9.0	9.0
	~20V #Bark			20% Bark
	Baseline Part. High Bark Flow 34% Bark	Partic. Test	Partic. Test	Brink Baseline

(Continued)

Data Sheet
6015
4/4/79

(Continued)

Test No.	3-27	3-27	3-27	3-28
Date	4-24-79	4-24-79	4-24-79	4-24-79
Time	10:00	11:09	11:40	14:34
East Grate Temp. (°F)	–	–	–	–
West Grate Temp. (°F)	–	–	–	–
Fuel Flow (Time/lbs)	10:16 | 8537	11:15 | 8560	11:45 | 8576	14:40 | 8649
Bark Screw (% max RPM)	22.5	22.5	22.5	22.5
Excess Air Setpoint	45	45	45	45
Furnace Draft Setpoint	57	57	57	57
Stoker Rotor Contr. Setpoint	10	10	15	20
Opacity (0-100%)	46-58	40-46	40-50	44-54
Grate Speed (indic.)	3.2 Fast	3.2 Fast	5.4 Fast	5.0 Fast
Spill Plate Setting	–	–	–	–
Overfire Air Damper (% Open)	100	100	100	100
TOTAL STEAM FLOW 10^3lb/hr	310	320	320	330
UNIT 6 " " "	90	90	100	90

KVB, INC.

ENGINEER B.

CONTROL ROOM DATA SHEET

Location: 3

FUEL: Coal and Bark

Test No.	3-29	3-30	3-31	3-32
Date	4-25-79	4-25-79	4-25-79	4-25-79
Time	9:00	9:45	10:52	11:33
Load (lb/hr) x 10^3	40	56	81	103
Stream Flow Integr. x 1250	380665	380700	380766	380817
Air Flow	38	49	73	97
F.W. Flow/Temp. (lb/hr/ °F)	50 | 256	70 | 256	90 | 256	110 | 256
Air Temp. Entering A.H. (°F)	88	88	86	84
Air Temp. Leaving A.H. (°F)	447	435	424	400
Gas Temp. Entering A.H. (°F)	525	539	550	585
Gas Temp. Leaving A.H. (°F)	420	419	420	430
CO_2 %	7.6	9.2	8.4	8.0
F.W. Press. (psig)	1020	1025	1025	1027
Steam Header Press. (psig)	575	575	570	570
S.H. Metal Temp. (°F)	731	730	725	743
S.H. Steam Temp. °F	748	754	760	772
F.D. Fan Press. (in. H_2O)	.6	1.0	2.0	3.4
A.H. Outlet Press. (in. H_2O)	.5	1.0	1.4	2.6
Plenum Press. (in. H_2O)	.5	.3	.6	1.2
Overfire Air Press. (in. H_2O)	15	15	15	15
Furnace Draft (in. H_2O)	-.2	-.2	-.2	-.15
Blr. Outlet Draft (in. H_2O)	-.6	-.6	-.9	-1.0
A.H. Outlet Draft (in. H_2O)	-1.6	-1.6	-2.0	-3.1
Classifier Outlet (in. H_2O)	-1.6	-1.7	-2.1	-3.5
Dust Collector Outlet (in. H_2O)	-4.2	-5.0	-5.9	-9.2
ID Fan Inlet (in. H_2O)	-11	-11.0	-11	-11.0
Bark Distrib. Air (in. H_2O)	7.0	8.0	8.0	8.0
	Load Swing Low Load 10% Bark	10% Bark	10% Bark	High Load 10% Bark

(Continued)

Data Sheet
6015
4/4/79

(Continued)

Test No.	3-29	3-30	3-31	3-32
Date	4-25-79	4-25-79	4-25-79	4-25-79
Time	9:00	9:45	10:52	11:33
East Grate Temp. (°F)	–	–	–	–
West Grate Temp. (°F)	–	–	–	–
Fuel Flow (Time/lbs)	9:16 9213	9:52 9226	10:56 9256	11:38 9282
Bark Screw (% max RPM)	11	11	11	11
Excess Air Setpoint	50	50	44	40
Furnace Draft Setpoint	57	57	57	57
Stoker Rotor Contr. Setpoint	0	28	47	80
Opacity (0-100%)	44 - 52	42 - 46	42 - 56	49 - 82
Grate Speed (indic.)	6.2 Fast	4.8 Fast	4.8 Fast	4.2 Fast
Spill Plate Setting	–	–	–	–
Overfire Air Damper (% Open)	100	100	95	100
TOTAL STEAM FLOW 10^3 lb/hr	320	320	350	340
UNIT 6 " " "	120	120	110	90

LOCATION 3 FUEL ANALYSES

Test No.	3-6	3-15	3-26	3-27	3-6	3-15	3-26	3-27
Date	4-13-79	4-18-79	4-23-79	4-24-79	4-13-79	4-18-79	4-23-79	4-24-79
Fuel Type	Coal	Coal	Coal	Coal	Wood	Wood	Wood	Wood
Ultimate Analysis								
Moisture, % weight	6.63	6.06	6.62	6.77	51.51	53.87	35.78	41.23
Carbon, %	64.89	66.12	61.83	62.60	25.58	23.93	33.59	31.01
Hydrogen, %	4.25	4.43	4.33	4.33	2.84	2.77	3.77	3.55
Nitrogen, %	1.48	1.53	1.45	1.50	0.16	0.17	0.17	0.20
Sulfur, %	2.36	1.96	3.01	2.30	0.030	0.029	0.025	0.026
Ash, %	8.94	8.46	12.20	11.07	1.51	1.42	1.61	1.56
Oxygen (diff.), %	11.45	11.44	10.56	11.43	18.37	17.81	25.05	22.42
Proximate Analysis								
Moisture, % weight	6.63	6.06	6.62	6.77	51.51	53.87	35.78	41.23
Ash, %	8.94	8.46	12.20	11.07	1.51	1.42	1.51	1.56
Volitale Matter, %	38.78	37.30	37.52	37.49	37.21	37.23	51.53	46.51
Fixed Carbon, %	45.65	48.18	43.66	44.67	9.77	7.48	11.08	10.70
Heat of Combustion								
Gross Btu/lb	12,050	12,160	11,580	11,470	8,950	8,890	9,060	8,890
Net Btu/lb	11,660	11,750	11,180	11,070	-	-	-	-
Bottom Ash								
Carbon, %	-	-	11.56	-	-	-	-	-
Gross Btu/lb	-	-	would not ignite	-	-	-	-	-
Fly Ash								
Carbon, %	33.21	-	25.74	-	-	-	-	-
Gross Btu/lb	4,370	-	3,590	-	-	-	-	-

HP-67 KEYED CALCULATION SHEET*

PARTICULATE EMISSION CALCULATIONS

Test No. 3-6 Date 4-13-79 Location 3 Engr. [illegible]

Unit No. 5 Fuel Coal & Bark Sampling Train and Method 5

Pitot Factor, Fs .83 Barometric Pressure, P_{bar} 29.90 (STO 0) in. Hg

Tot. Liquid Collected, V_{lc} 70 (STO 1) ml Total Particulate, M_n 249.8 (298.4) (STO 2) m gm

Velocity Head, ΔP .116 (STO 3) iwg Stack Temp., Ts 400 (STO 4) °F Stack Area, As 23.35 (STO 5) ft^2

Sample Volume, Vm 44.39 (STO 6) ft^3 Stack Press., Psg -.32 (STO 7) iwg Excess O_2, XO_2% 8.6 (STO 8) %

Orifice Press. Diff., H .534 (STO 9) iwg Stack Gas Sp. Gravity, Gs 1.0 (STO A) n.d.

Sample Time, θ 100 (STO B) min Nozzle Dia., Dn .375 (STO C) in. Meter Temp., T_m 65 (STO D) °F

Select Fe	Oil (A)	Gas (B)	Coal (C)	Other: < [illegible]% Bark
SC Feet/10^4 Btu	92.2	87.4	98.2	97.8 (D)

Press (E) if meter is not temperature compensated.

1. Sample Gas Volume $Vm_{std} = 0.0334\ Vm(P_{bar} + H/13.6)$ 44.61 ✓ SCF
2. Water Vapor $Vw_{std} = 0.0474\ V_{lc}$ 3.318 ✓ SCF
3. Moisture Content $Bwo = Eq.\ 2/(Eq.\ 1 + Eq.\ 2)$ .069 ✓ N.D.
4. Concentration a. $C = 0.0154\ Mn/Vm_{std}$ (.1026) ✓ .086 ✓ grains/DSCF
   b. $C = 2.205 \times 10^{-6}\ Mn/Vm_{std}$ .00001 ✓ lb/DSCF
   c. $C = Eq.\ 4b \times 16.018 \times 10^3$ (.2352) .1969 ✓ grams/DSCM
5. Abs. Stack Press. $Ps = P_{bar} \times 13.6 + Psg$ 406.32 ✓ in. w abs.
6. Stack Gas Speed $Vs = 174\ Fs \sqrt{\Delta P Ts} \sqrt{\frac{407}{Ps} \times \frac{1.00}{Gs}}$ 1455.82 ✓ ft/min
7. Stack Gas Flow Rate @ 70°F a. $Qsw = Eq.\ 6 \times As \times \frac{530}{Ts} \times \frac{Ps}{407}$ 20911 ✓ WSCF/min
   b. $Qsd = Eq.\ 7a \times (1. - Eq.\ 3)$ 19470 ✓ DSCF/min
8. Material Flow $Ms = Eq.\ 7b \times Eq.\ 4b \times 60$ (17.15) 14.36 ✓ lb/hr
9. XO_2 factor $XO_2f = 2090/(20.9 - XO_2\%)$ 169.92 ✓ N.D.
10. Emission a. $E = Eq.\ 4b \times Fe \times Eq.\ 9$ (.2440) ✓ .2043 ✓ lb/MMBtu
    b. $E = Eq.\ 4c \times Fm \times Eq.\ 9 \times 1000$ (104.94) ✓ 87.8 ✓ ng/joule
11. % Isokinetic $I = \dfrac{14077 \times Ts(Vm_{std} + Vw_{std})}{\theta \times Vs \times Ps \times Dn^2}$ 70.05 ✓ %

*If calculating by hand:
1) Convert T_s and T_m to °R
2) Multiply EQ 1 by $530/T_m$(°R) if meter not temperature compensated.
3) $F_m = 2.684 \times 10^{-5} \times F_e$

Data Sheet 6002-4
Revised 2/15/78

HP-67 KEYED CALCULATION SHEET*

PARTICULATE EMISSION CALCULATIONS

Test No. 3-15 Date 4-18-79 Location 3 Engr. Ks

Unit No. 5 Fuel Coal & Bark Sampling Train and Method 5

Pitot Factor, Fs .83 Barometric Pressure, P_{bar} 30.6 (STO 0) (41.3) in. Hg

Tot. Liquid Collected, V_{1c} 99 (STO 1) ml Total Particulate, M_n 41.5 (STO 2) m gm

Velocity Head, ΔP .076 (STO 3) iwg Stack Temp., Ts 420 (STO 4) °F Stack Area, As 5.35 (STO 5) ft^2

Sample Volume, Vm 38.63 (STO 6) ft^3 Stack Press., Psg -.32 (STO 7) iwg Excess O_2, XO_2% 4.7 (STO 8) %

Orifice Press. Diff., H .478 (STO 9) iwg Stack Gas Sp. Gravity, Gs 1.0 (STO A) n.d.

Sample Time, θ 100 (STO B) min Nozzle Dia., Dn .375 (STO C) in. Meter Temp., T_m 73 (STO D) °F

Select Fe	Oil (A)	Gas (B)	Coal (C)	Other: 6% [illegible]
SC Feet/10^4 Btu	92.2	87.4	98.2	97.96 (D)

Press (E) if meter is not temperature compensated.

1. Sample Gas Volume $Vm_{std} = 0.0334\ Vm(P_{bar} + H/13.6)$ 39.30 ✓ SCF
2. Water Vapor $Vw_{std} = 0.0474\ V_{1c}$ 4.69 ✓ SCF
3. Moisture Content Bwo = Eq. 2/(Eq. 1 + Eq. 2) .107 (.1935) N.D.
4. Concentration a. $C = 0.0154\ Mn/Vm_{std}$ .1636 (.00003) grains/DSCF
   b. $C = 2.205 \times 10^{-6}\ Mn/Vm_{std}$ .00002 lb/DSCF
   c. $C = \text{Eq. 4b} \times 16.018 \times 10^3$ (1.44161) .375 grams/DSCM
5. Abs. Stack Press. $Ps = P_{bar} \times 13.6 + Psg$ 415.84 ✓ in. w abs.
6. Stack Gas Speed $Vs = 174\ Fs \sqrt{\Delta P Ts} \sqrt{\frac{407}{Ps} \times \frac{1.00}{Gs}}$ 1178 ✓ ft/min
7. Stack Gas Flow Rate @ 70°F a. $Qsw = \text{Eq. 6} \times As \times \frac{530}{Ts} \times \frac{Ps}{407}$ 16928 ✓ WSCF/min
   b. Qsd = Eq. 7a x (1. - Eq. 3) 15122 ✓ (25.01) DSCF/min
8. Material Flow Ms = Eq. 7b x Eq. 4b x 60 21.26 lb/hr
9. XO_2 factor $XO_2f = 2090/(20.9 - XO_2\%)$ 126.61 ✓ (.5040) N.D.
10. Emission a. E = Eq. 4b x Fe x Eq. 9 .4283 (216.70) lb/MMBtu
    b. E = Eq. 4c x Fm x Eq. 9 x 1000 184.15 ng/joule
11. % Isokinetic $I = \frac{14077 \times Ts(Vm_{std} + Vw_{std})}{\theta \times Vs \times Ps \times Dn^2}$ 79.1 %

*If calculating by hand:
1) Convert T_s and T_m to °R
2) Multiply EQ 1 by $530/T_m$(°R) if meter not temperature compensated.
3) $F_m = 2.684 \times 10^{-5} \times F_e$

Data Sheet 6002-4
Revised 2/15/78

HP-67 KEYED CALCULATION SHEET*

PARTICULATE EMISSION CALCULATIONS

Test No. 3-26 Date 4-23-79 Location 3 Engr.

Unit No. 5 Fuel Coal & Bark Sampling Train and Method

Pitot Factor, Fs .83 Barometric Pressure, P_{bar} 30.40✓ (STO 0) in. Hg

Tot. Liquid Collected, V_{1c} 129.9✓ (STO 1) ml Total Particulate, M_n (362.4) 310.1 (STO 2) m gm

Velocity Head, ΔP .058✓ (STO 3) iwg Stack Temp., Ts 420✓ (STO 4) °F Stack Area, As 23.35 (STO 5) ft^2

Sample Volume, Vm 40.95✓ (STO 6) ft^3 Stack Press., Psg -.33✓ (STO 7) iwg Excess O_2, XO_2% 8.2✓ (STO 8) %

Orifice Press. Diff., H .3941 (STO 9) iwg Stack Gas Sp. Gravity, Gs 1.0 (STO A) n.d.

Sample Time, θ 100✓ (STO B) min Nozzle Dia., Dn .375✓ (STO C) in. Meter Temp., T_m 89✓ (STO D) °F

Select F_e	Oil (A)	Gas (B)	Coal (C)	Other: ~20% Bark
SC Feet/10^4 Btu	92.2	87.4	98.2	97.88 (–)

Press (E) if meter is not temperature compensated.

1. Sample Gas Volume	$Vm_{std} = 0.0334\ Vm(P_{bar} + H/13.6)$	40.18✓	SCF
2. Water Vapor	$Vw_{std} = 0.0474\ V_{1c}$	6.16✓	SCF
3. Moisture Content	Bwo = Eq. 2/(Eq. 1 + Eq. 2)	.133	N.D.
4. Concentration	a. $C = 0.0154\ Mn/Vm_{std}$	(.1389) .1184	grains/DSCF
	b. $C = 2.205 \times 10^{-6}\ Mn/Vm_{std}$	(1.99×10^{-5}) 1.7×10^{-5}	lb/DSCF
	c. $C = \text{Eq. 4b} \times 16.018 \times 10^3$	(.3186) .2726	grams/DSCM
5. Abs. Stack Press.	$Ps = P_{bar} \times 13.6 + Psg$	413.110	in. w abs.
6. Stack Gas Speed	$Vs = 174\ Fs \sqrt{\Delta P Ts} \sqrt{\frac{407}{Ps} \times \frac{1.00}{Gs}}$	1032.74	ft/min
7. Stack Gas Flow Rate @ 70°F	a. $Qsw = \text{Eq. 6} \times As \times \frac{530}{Ts} \times \frac{Ps}{407}$	14739	WSCF/min
	b. Qsd = Eq. 7a x (1. - Eq. 3)	12780	DSCF/min
8. Material Flow	Ms = Eq. 7b x Eq. 4b x 60	(15.35) 13.05	lb/hr
9. XO_2 factor	$XO_2f = 2090/(20.9 - XO_2\%)$	164.57✓	N.D.
10. Emission	a. E = Eq. 4b x Fe x Eq. 9	(.3204) .2742	lb/MMBtu
	b. E = Eq. 4c x Fm x Eq. 9 x 1000	(137.77) 117.89	ng/joule
11. % Isokinetic	$I = \frac{14077 \times Ts(Vm_{std} + Vw_{std})}{\theta \times Vs \times Ps \times Dn^2}$	95.67✓	%

*If calculating by hand:
1) Convert T_s and T_m to °R
2) Multiply EQ 1 by $530/T_m$(°R) if meter not temperature compensated.
3) $F_m = 2.684 \times 10^{-5} \times F_e$

Data Sheet 6002-4
Revised 2/15/78

HP-67 KEYED CALCULATION SHEET*

PARTICULATE EMISSION CALCULATIONS

Test No. 3-27 Date 4-26-79 Location 3 Engr. [illegible]

Unit No. 5 Fuel Coal & Bark Sampling Train and Method 5

Pitot Factor, Fs .83 Barometric Pressure, P_{bar} 30.31 ✓ (STO 0) (474.91) in. Hg

Tot. Liquid Collected, V_{1c} 129 ✓ (STO 1) ml Total Particulate, M_n 428.5 (STO 2) m gm

Velocity Head, ΔP .0816 ✓ (STO 3) iwg Stack Temp., Ts 420 ✓ (STO 4) °F Stack Area, As 23.35 (STO 5) ft^2

Sample Volume, Vm 48.62 ✓ (STO 6) ft^3 Stack Press., Psg -.28 ✓ (STO 7) iwg Excess O_2, XO_2% 9.6 ✓ (STO 8) %

Orifice Press. Diff., H .558 ✓ (STO 9) iwg Stack Gas Sp. Gravity, Gs 1.0 ✓ (STO A) n.d.

Sample Time, θ 100 ✓ (STO B) min Nozzle Dia., Dn .375 ✓ (STO C) in. Meter Temp., T_m 91.6 ✓ (STO D) °F

Select Fe	Oil (A)	Gas (B)	Coal (C)	Other: [illegible]
SC Feet/10^4 Btu	92.2	87.4	98.2	97.82 (_)

Press (E) if meter is not temperature compensated.

1. Sample Gas Volume $Vm_{std} = 0.0334\ Vm(P_{bar} + H/13.6)$ 47.36 ✓ SCF
2. Water Vapor $Vw_{std} = 0.0474\ V_{1c}$ 6.11 ✓ SCF
3. Moisture Content $Bwo = Eq.\ 2/(Eq.\ 1 + Eq.\ 2)$ .114 ✓ N.D. (.544)
4. Concentration a. $C = 0.0154\ Mn/Vm_{std}$ .1393 grains/DSCF
   b. $C = 2.205 \times 10^{-6}\ Mn/Vm_{std}$ .00002 lb/DSCF (.3541)
   c. $C = Eq.\ 4b \times 16.018 \times 10^3$ .3196 grams/DSCM
5. Abs. Stack Press. $Ps = P_{bar} \times 13.6 + Psg$ 411.94 ✓ in. w abs.
6. Stack Gas Speed $Vs = 174\ Fs\ \sqrt{\Delta P Ts}\ \sqrt{\frac{407}{Ps} \times \frac{1.00}{Gs}}$ 1227 ✓ ft/min
7. Stack Gas Flow Rate @ 70°F a. $Qsw = Eq.\ 6 \times As \times \frac{530}{Ts} \times \frac{Ps}{407}$ 17458 WSCF/min
   b. $Qsd = Eq.\ 7a \times (1. - Eq.\ 3)$ 15461 DSCF/min (20.51)
8. Material Flow $Ms = Eq.\ 7b \times Eq.\ 4b \times 60$ 18.51 lb/hr
9. XO_2 factor $XO_2f = 2090/(20.9 - XO_2\%)$ 184.96 N.D. (1.3499)
10. Emission a. $E = Eq.\ 4b \times Fe \times Eq.\ 9$ .36101 lb/MMBtu (171.97)
    b. $E = Eq.\ 4c \times Fm \times Eq.\ 9 \times 1000$ 155.24 ng/joule
11. % Isokinetic $I = \dfrac{14077 \times Ts(Vm_{std} + Vw_{std})}{\theta \times Vs \times Ps \times Dn^2}$ 93.22 %

*If calculating by hand:
1) Convert T_s and T_m to °R
2) Multiply EQ 1 by $530/T_m$(°R) if meter not temperature compensated.
3) $F_m = 2.684 \times 10^{-5} \times F_e$

Data Sheet 6002-4
Revised 2/15/78

PARTICULATE CALCULATION SHEET

Test No. 3-6 (Inlet, Outlet)
Box No.
Test Description: Baseline before modification (≈ 25% Back)

Location 3
Test Date 4/13/79

Dry Gas Meter Vol (ft3)
Final 683.44
Initial 639.05
Total 44.39

Impinger Water Vol (ml)

	1	2	3	~~Total~~	
Final	150	110		160	
Initial	100 ml	100 m.	0	150	
△ Vol	50	10	0	10	70

								Filter No.	Blank No.
Beaker No.		1	2	4	7	8	5	2	
Date Weighed		4-11-79	4-1-79	4-11-79	4-11-79		4-11-79	4-11-79	
Tare Wt.	1	100.0751	100.6031	100.7834	04.0028	99.3184	99.9094	.7479	
	2	100.0750	100.6033	100.7834	104.0028	99.3181	99.9096	.7483	
	3	100.0748	100.6034	100.7836	104.003	99.3187	99.9095	.7484	
	4								
	5								
	6								
	Avg	100.0750	100.6033	100.7835	104.0029	99.3184	99.9095	.7482	
Bottle No.		1	2	3	Acet Blank	H₂O Blank			
Content		Impinger (Water)	Probe (Acetone)	Probe (Water)	~~Cyclone~~ (~~Acetone~~)		Flask (Dry)		
Rinse (ml)		200, 130	175	200	200	200			
ate Weighed or 250 Bake)									
Final Wt. 250	1	100.0965	100.6524	100.8090	104.0034	99.3193	99.9132	.9451	
	2	100.0961	100.6521	100.8090	104.0035	99.3191	99.9134	.9450	
	3	100.0962	100.6519	100.8086	104.0033	99.3192	99.9134	.9449	
	4								
	5								
	6								
	Avg	100.0963	100.6521	100.8089	104.0034	99.3191	99.9133	.9450	
Residue Wt Final 250 Tare)		.0213 ✓	.0488 ✓	.0254 ✓	.0005 ✓	.0007 ✓	.0038 ✓	.1968 ✓	
Date Weighed or 650 Bake)									
Final Wt. 650	1								
	2								
	3								
	4								
	5								
	6								
	Avg								
Residue Wt. Final 650 Tare)									

Comments:

Meth 5	Mod Meth 5
.0488	.0213
.0038	.0488
.1968	.0254
.0004 Acet Bl	.0038
.2498 ✓	.1968
	.0004
	.0019
	.2984 ✓

8830-5

PARTICULATE CALCULATION SHEET

Test No. 3-15 (Inlet, Outlet)
Box No.
Test Description: Baseline after Midification (+16% Eauiflow)

Location 3
Test Date 4/18/79

Dry Gas Meter Vol (ft3)
Final 722.43
Initial 683.80
Total 38.63

Impinger Water Vol (ml) 4

	1	2	3		tot.
Final	198 ml	90	2	159	
Initial	100	100	0	150 g	
△ Vol	+98	-10	+2	+9	99

							Filter No.	Blank No.
Beaker No.		9	10	11		12	#3	
Date Weighed		4/11	4/11	4/17		4/17	4/11/79	
Tare Wt.	1	100.1854	100.9330	99.7911		100.9668	.7511	
	2	100.1854	100.9333	99.7915		100.9669	.7508	
	3	100.1855	100.9334	99.7916		100.9667	.7506	
	4							
	5							
	6							
	Avg	100.1854	100.9332	99.7914		100.9668	.7508	
Bottle No.		#1	#2	#3				
Content		Impinger (Water)	Probe (Acetone)	Probe (Water)	Cyclone (Acetone)	Flask (Dry)		
Rinse (ml)		290 ml	200	665 ml				
te Weighed or 250 Bake)								
Final Wt. 250	1	100.2187	100.9964	99.8288		100.9706	1.1009	
	2	100.2189	100.9963	99.8285		100.9705	1.1010	
	3	100.2187	100.9963	99.8286		100.9705	1.1012	
	4							
	5							
	6							
	Avg	100.2187	100.9963	99.8286		100.9705	1.1010	
Residue Wt Final 250 Tare)		.03330 ✓	.06310 ✓	.03720 ✓		.00370 ✓	.35021	
Date Weighed or 650 Bake)								
Final Wt. 650	1							
	2							
	3							
	4							
	5							
	6							
	Avg							
Residue Wt. Final 650 Tare)								

Comments:

Meth 5
.06310
.00370
.3502
.0005
.4175 ✓

Modif 5
.0333
.06310
.0372
.0037
.3502
.0005
.0033
.4913 ✓

PARTICULATE CALCULATION SHEET

Test Crew

Test No. 3-26 Date 4-23-79 Location 3

Box No.

Sample Probe Position

Test Description low NOx Test (≈ 20% Bark)

Dry Gas Meter Vol. (ft^3)

Final 763.87

Initial 727.92

Total 40.95

Impinger Water Vol (ml)

	1	2	3	S. Gel	Total
Final	171	136	8	175.0	
Initial	100	100	0	160.1 *	
Δ Vol	71	36	8	14.9	129.9

						Filter No. 5	Blank No.
Beaker No.	#1	#2	#4		#13		
Date Weighed	[illegible] 4/23	4/23	4/23		4/17	4-18-79	
Tare Wt. 1	100.0762	100.6232	100.7846		103.3652	.7476	
2	100.0760	100.6233	100.7855		103.3653	.7475	
3	100.0761	100.6233	100.7846		103.3654	.7475	
4							
5							
6							
Avg	100.0761	100.6233	100.7845		103.3653	.7475	
Bottle No.	1	2	3				
Content	Impinger (Water)	Probe (Acetone)	Probe (Water)	Cyclone (Acetone)	Flask (Dry)		
Rinse (ml)	134 200	200	200 + 172				
Date Weighed or 250 Bake	4/25 #1	4/23 #2	4/25 #4		4/25 #13	Filter #5 4/25	
Final Wt. 250 1	100.1020	100.6597	100.8083		103.3711	1.0149	
2	100.1020	100.6596	100.8086		103.3710	1.0151	
3	100.1022	100.6594	100.8084		103.3710	1.0152	
4							
5							
6							
Avg	100.1021	100.6596	100.8084		103.3710	1.0151	
Residue wt Final 250-Tare	.0260	.0363	.0239		.0057	.2676	
Date Weighed or 650 Bake							
Final Wt. 650 1							
2							
3							
4							
5							
6							
Avg							
Residue Wt Final 650-Tare							

Comments:

Data Sheet 6002-3

Meth 5	Mod. 5
.0363	.3101
.0057	.0260
.2676	.0239
.0005	.0024
.3101	.3624

* weight w/ impinger; silica gel alone wt = 160.1 g

PARTICULATE CALCULATION SHEET

Test Crew__________

Test No. 3-27 Date 4-24-79 Location 5

Box No.__________ Sample Probe Position__________

Test Description Baseline, After Modification (+24% Bar/flow)

Dry Gas Meter Vol. (ft^3)

Final 812.62

Initial 764.0

Total 48.62

Impinger Water Vol (ml)

	1	2	3	S. Gel	Total
Final	194	122	2	161	
Initial	100	100	0	150	
Δ Vol	94	22	2	11	129

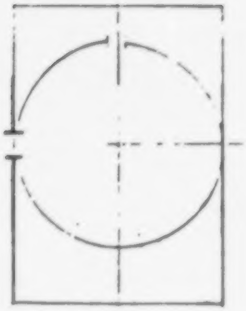
							Filter No.	Blank No.
Beaker No.		A	B	C		#5	#4	
Date Weighed		4/24	4/24	4/24		4/23	4/11	
Tare Wt.	1	100.6698	98.5666	101.6376		99.9102	.7456	
	2	100.6697	98.5667	101.6378		99.9100	.7455	
	3	100.6723	98.5671	101.6375		99.9102	.7451	
	4							
	5							
	6							
	Avg	100.6700	98.5668	101.6376		99.9101	.7454	
Bottle No.		1	2	3				
Content		Impinger (Water)	Probe (Acetone)	Probe (Water)	Cyclone (Acetone)	Flask (Dry)		
Rinse (ml)		200+122	200	200+124				
Date Weighed or 250 Bake		4/25 A	4/25 B	4/25 C		4/25 #5	4/25 Filter #4	
Final Wt. 250	1	100.6965	98.6378	101.6551		99.9343	1.0981	
	2	100.6967	98.6377	101.6549		99.9341	1.0750	
	3	100.6965	98.6381	101.6545		99.9341	1.0784	
	4							
	5							
	6							
	Avg	100.6966	98.6379	101.6549		99.9342	1.0782	
Residue wt Final 250-Tare		.0266	.0711	.0173		.0241	.3328	
Date Weighed or 650 Bake								
Final Wt. 650	1							
	2							
	3							
	4							
	5							
	6							
	Avg							
Residue Wt Final 650-Tare								

Comments:

Meth. 5	Mod Meth 5
.0711	.4285
.0241	.0266
.3328	.0173
.0005	.0023 H_2O
.4285	.4747

Data Sheet 6002-3

SMOKESTACK FLOW PROFILE



TEST NO. 3-6
LOCATION NO. 3
DATE 4-12-79
SAMPLING LOCATION
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) ______ BAROMETRIC PRESS, in.Hg ______
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) ______ STACK PRESS., Ps, iwg ______
STACK I.D. (DISTANCE A - DISTANCE B) ______ STK. GAS SP. GRAVITY, G_s ______
NEAREST UPSTREAM DISTURBANCE
NEAREST DOWNSTREAM DISTURBANCE

TRAVERSE POINT NUMBER	% OF STACK DIAMETER	DISTANCE FROM INSIDE WALL	VELOCITY HEAD (ΔP_s), in. H_2O	STACK TEMPERATURE (T_s), °F	OXYGEN %	STACK GAS SPEED, Vs ft/min
1.		11.5"	0.25	423		
2.			0.18			
3.			0.08			
4.			0.04			
5.			0.01			
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						
Average			0.112			

STACK GAS SPEED, $V_s = 174\, F_s \sqrt{\overset{\text{Average}}{\Delta P}(T_s + 460)\left(\frac{407}{P_s}\right)\left(\frac{1.00}{G_s}\right)}$

$P_s = -0.32$
$P_{bar}: 29.9''$ Hg

Table C-10.

K V B, INC.

STACK DATA

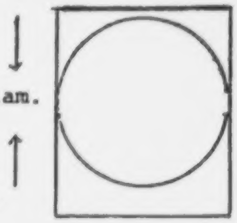
Test No. 3-6
Engr. K.

APR 13 1979 Location ______ Unit No. 5 Fuel Coal & Bark

Load ______ K#/hr or MBtu/hr Filter No. 2

Sample Box No. ______ Meter Box No. ______ Probe No. ______ Probe Length 6'

Filter Heater Setting ______
Probe Heater Setting ______
Stack Moisture est. 37 %
Ambient Temperature ______ °F
Nozzle Diameter 3/8 in.
Atmospheric Pressure 29.90 in.Hg
Weather ______
Stack Gas Pressure, Ps -.32 iwg
Stack Gas Sp. Gravity, Gs 1.0 n.d.
Stack Area, As 58"x58" ~~ft²~~ 23.35



Remarks

Time	Vm Meter Volume Reading (CF)	Vacuum Gage Reading (iwg)	ΔP Pitot Tube Pressure (iwg)	H Orfice Pressure Diff (°F)	Stack Temp. (°F)	Impinger Temperature Out (°F)	Impinger Temperature In (°F)	Filter Box Temp. (°F)	Meter Temp. (°F)
1224 1)	641.68	.5	.02	.08	400	100	45	270	55
1245 2)	647.88	.9	.05	.23	400	112	40	300	60
1303 3)	655.81	1.2	.08	.37	400	150	40	310	65
1330 4)	667.96	2.	.17	.79	400	130	45	310	70
1353 5)	623.58	3.5	.26	1.2	400	140	45	325	75
Total					°F				
Avg.			.1161	.5341	400 °F + 460				65

Ts= ______ °R

stop - 683.44
start - 639.05
44.39

Table C-10.

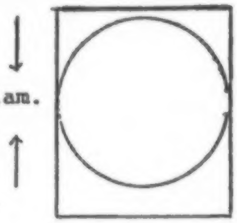
K V B, INC.

STACK DATA

Test No. 3-15
Engr. K.

4-18-79 Location ____ Unit No. 5 Fuel Coal & Bark
Load 78 K#/hr or MBtu/hr Filter No. 3
Sample Box No.____ Meter Box No.____ Probe No.____ Probe Length____

Filter Heater Setting ____
Probe Heater Setting ____
Stack Moisture ____ %
Ambient Temperature 60 °F
Nozzle Diameter 3/8 in.
Atmospheric Pressure 30.6 in.Hg
Weather ____
Stack Gas Pressure, Ps -.32 iwg
Stack Gas Sp. Gravity, Gs 1.0 n.d.
Stack Area, As ____ ft²



Remarks

Start 683.80

Time	Vm Meter Volume Reading (CF)	Vacuum Gage Reading (iwg)	ΔP Pitot Tube Pressure (iwg)	H Orfice Pressure Diff (°F)	Stack Temp. (°F)	Impinger Temperature Out (°F)	Impinger Temperature In (°F)	Filter Box Temp. (°F)	Meter Temp. (°F)
1015 1)	687.38	0.8	.02	.12	420	160	48	300	65
1038 2)	692.40	1.1	.03	.17	↓	162	50	305	65
1102 3)	701.40	2.8	.07	.39		190	50	330	70
1128 4)	711.51	3.3	.09	.51		175	55	340	75
1150 5)	722.43	6.6	.17	.95		235	50	345	90
Total					°F				
Avg.			.076✓	.428✓	420 °F + 460				73✓

Ts= ____ °R

Stop - 722.43
Start - 683.20
38.63

Table C-10.

K V B, INC.

STACK DATA

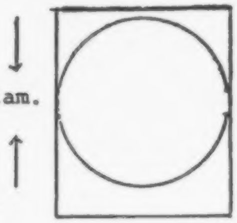
Test No. 3-26
Engr. E.

4 21 79 Location 3 Unit No. 5 Fuel Coal & Bark

Load 88 K#/hr or MBtu/hr Filter No. 5

Sample Box No. ____ Meter Box No. ____ Probe No. ____ Probe Length ____

Filter Heater Setting ____
Probe Heater Setting ____
Stack Moisture ____ %
Ambient Temperature ____ °F
Nozzle Diameter 3/8 in.
Atmospheric Pressure 30.40 in.Hg
Weather clear
Stack Gas Pressure, Ps -.33 iwg
Stack Gas Sp. Gravity, Gs 1.0 n.d.
Stack Area, As ____ ft²



Remarks

Start - 0722.92

Time 20 min Partics	Vm Meter Volume Reading	Vacuum Gage Reading	ΔP Pitot Tube Pressure	H Orfice Pressure Diff	Stack Temp.	Impinger Temperature		Filter Box Temp.	Meter Temp.
						Out	In		
	(CF)	(iwg)	(iwg)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)
5 1120 1)	727.08	.7	.02	.14	420	160	55	295	75
1142 2)	732.75	1.3	.03	.20	420	195	55	300	85
1205 3)	739.34	1.6	.04	.27	420	215	58	320	90
[illegible] 4)	749.52	3.2	.08	.54	420	220	70	330	95
[illegible] 5)	763.87	4.8	.12	.82	420	220	70	340	100
Total					°F				
Avg.			.058 ✓	.394 ✓	420 °F				89
					+ 460				

Ts= ______ °R

Stop - 763.87
Start - 722.92
40.95

Table C-10.

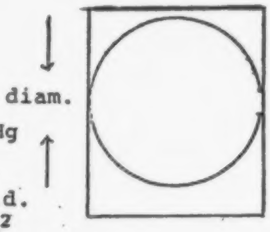
KVB, INC.

STACK DATA

Test No. 3-27
Engr. Kn

4/24 Thrs Location 3 Unit No. 5 Fuel Coal & Bark
83 K#/hr or MBtu/hr Filter No. 4
Sample Box No.____ Meter Box No.____ Probe No.____ Probe Length 6'

Filter Heater Setting 5-320°
Probe Heater Setting 5 320°
Stack Moisture ____ %
Ambient Temperature ____ °F
Nozzle Diameter 1/4 in.
Atmospheric Pressure 30.31 in.Hg
Weather ____
Stack Gas Pressure, Ps -.28 iwg
Stack Gas Sp. Gravity, Gs 1.0 n.d.
Stack Area, As ____ ft²



Remarks

meter start - 764.00

Time 20 min. Points	Vm Meter Volume Reading (CF)	Vacuum Gage Reading (iwg)	ΔP Pitot Tube Pressure (iwg)	H Orfice Pressure Diff (°F)	Stack Temp. (°F)	Impinger Temperature		Filter Box Temp. (°F)	Meter Temp. (°F)
						Out (°F)	In (°F)		
10:05 1)	767.41	.8	.018	.12	420	145	55	260	85
10 34 2)	775.30	2.6	.05	.34	420	180	55	290	85
1056 3)	784.31	3	.07	.48	420	210	55	305	95
1118 4)	797.01	5.2	.11	.75	420	230	55	310	95
1144 5)	812.62	7.6	.16	1.1	420	230	55	315	98
Total					°F				
Avg.			0.08161	.5581	420 °F				91.6
					+ 460				

Ts= ____ °R

Finish 812.62
start - 764.00
48.62

Test No. 3-24

CASCADE IMPACTOR DATA SHEET

TEST RUN NO. 3-24 LOCATION 3 DATE 4-20-79

IMPACTOR NO. 1 CYCLONE NO. 1 OPERATOR H & G

SAMPLE POINT LOCATION center of stack

SUBSTRATE COATING Filters FUEL Coal & Bark TEST LOAD 77.0 klb/hr

IMPACTOR ORIENTATION ______ FLOW THRU IMPACTOR .035 ideal CFM

FLUE STATIC PRESSURE -.25 inH_2O, VELOCITY Δp = .06" H_2O 14.49 ft/sec.

NOZZLE DIA. 2.0 mm IMPACTOR PRESSURE DROP ______ END TIME 10.51

GAS METER END 488.724 CF START TIME 10.11

GAS METER START 487.428 CF DURATION 40

GAS VOLUME 1.296 CF = 1.328 scf = .03759 m^3 FLOW RATE .0324 CFM

AMBIENT TEMPERATURE 62 °F PRESSURE 30.30 IN Hg. HUMIDITY ______ %

FLUE GAS MOLECULAR WT. ______, TEMP. 420 °F, DENSITY ______ g/cc, VISCOSITY ______ POISE

Meter Temp. 95°F coal scale 9:36 6056
Meter Vac 10" HG 11:11 6092

$\%O_2 = 9.9$

	Stage Number							Stage Blank
	1	2	3	4	5 *			
Foil + Sample, g	3.6606	3.3513	3.7351	3.2818	3.7552			
Unused Foil, g	3.6587	3.3489	3.7327	3.2807	3.7528			
Sample, g	.0019	.0024	.0024	.0011	.0024			
Correction for Blank, g								
Final Sample, g								

FILTER NO.	Sample	Blank
FILTER + SAMPLE, g	.0369 *	
FILTER TARE, g	.0364	
SAMPLE, g		
CORRECTION FOR BLANK, g		
FINAL SAMPLE, g	.0005	

* last stage plugged

FULL CONTAINER, g 99.3240

EMPTY CONTAINER, g 99.3186

CYCLONE CATCH, g .0054

Total Catch wt. (mg) = 16.1

⇒ 428.3 mg/nm^3

⇒ 213.6 ng/J

60-20

Test No. 3-28

CASCADE IMPACTOR DATA SHEET

TEST RUN NO. 3-28 LOCATION 3 DATE 4-24-79

IMPACTOR NO. 1 CYCLONE NO. 1 OPERATOR M & G

SAMPLE POINT LOCATION center of duct

SUBSTRATE COATING Filter FUEL Coal & Bark TEST LOAD 84 klb/hr

IMPACTOR ORIENTATION ________ FLOW THRU IMPACTOR .04 acfm ideal CFM

FLUE STATIC PRESSURE -.27 inH_2O, VELOCITY .08" H2O - 20.2 ft/sec.

NOZZLE DIA. 2 mm IMPACTOR PRESSURE DROP ________ END TIME 16:21

GAS METER END 492.235 CF START TIME 15:41

GAS METER START 490.723 CF DURATION 40 min

GAS VOLUME 1.512 CF ⇒ 1.5272 SCF = .04324 m^3 FLOW RATE .0378 CFM

AMBIENT TEMPERATURE 70 °F PRESSURE 30.22 IN Hg. HUMIDITY ________ %

FLUE GAS MOLECULAR WT. ________, TEMP. 420 °F, DENSITY ________ g/cc, VISCOSITY ____ POISE

Meter Temp. 90° F

Meter Vac. 10" HG

Coal scale 14:40 8649

16:36 8700

$\% O_2 = 9.4$

	Stage Number							Stage Blank
	1	2	3	4	5			
Foil + Sample, g	3.6610	3.3510	3.7361	3.2852	3.7555			
Unused Foil, g	3.6600	3.3494	3.7338	3.2804	3.7537			
Sample, g	.0010	.0016	.0023	.0048	.0018			
Correction for Blank, g								
Final Sample, g								

FILTER NO.	Sample	Blank
FILTER + SAMPLE, g	.0394	
FILTER TARE, g	.0386	
SAMPLE, g	.0008	
CORRECTION FOR BLANK, g		
FINAL SAMPLE, g	.0008	

FULL CONTAINER, g 104.0068

EMPTY CONTAINER, g 104.0010

CYCLONE CATCH, g .0058

Tot. Catch wt = 18.1 mg

⇒ 418.6 mg/nm³

⇒ [illegible] ng/J

Test No. 3-24

.035 cfm.
488.78

CASCADE IMPACTOR DATA SHEET

TEST RUN NO. 3-24 LOCATION ______ DATE 4-20-79

IMPACTOR NO. 1 CYCLONE NO. 1 OPERATOR [illegible]

SAMPLE POINT LOCATION Center of stack

SUBSTRATE COATING none (Filters) FUEL Coal & Bark TEST LOAD ______ klb/hr

IMPACTOR ORIENTATION ______ FLOW THRU IMPACTOR .035 calculated CFM

FLUE STATIC PRESSURE -.25 inH_2O, VELOCITY Δp - .06 17.49 ft/sec

NOZZLE DIA. 2.0 mm IMPACTOR PRESSURE DROP ______ END TIME 10:57

GAS METER END 488.724 CF START TIME 10:11

GAS METER START 487.428 CF DURATION 46 min

.035 for isokin

GAS VOLUME 1.296 CF FLOW RATE ~~.0288~~ CFM

AMBIENT TEMPERATURE 62 °F PRESSURE 30.30 IN Hg. HUMIDITY ______

FLUE GAS MOLECULAR WT. ______, TEMP. 420 °F, DENSITY ______ g/cc, VISCOSITY ______ POISE

Meter Vac. = 10"Hg Meter Temp. = 95°F

	Stage Number							Stage Blank
	1	2	3	4	5			
Foil + Sample, g	3.6606	3.3513	3.7351	3.2818	3.7552			
Plate & Filter ~~Unused Foil~~, g	3.6587	3.3489	3.7327	3.2807	3.7528			99.3186
Sample, g	.0019	.0024	.0024	.0011	.0024			
Correction for Blank, g								
Final Sample, g								

Coal scale -6056 - 9:36
6092 - 11:11

FILTER NO.	Sample	Blank
FILTER + SAMPLE, g	0.0364	
FILTER TARE, g	.0369	
SAMPLE, g		
CORRECTION FOR BLANK, g		
FINAL SAMPLE, g		

FULL CONTAINER, g ______

EMPTY CONTAINER, g 99.3186

CYCLONE CATCH, g ______

Test No. 3-28

CASCADE IMPACTOR DATA SHEET

TEST RUN NO. 3-28 LOCATION ______ DATE 4-26-79

IMPACTOR NO. 1 CYCLONE NO. 1 OPERATOR M. G.

SAMPLE POINT LOCATION center of duct

SUBSTRATE COATING Filter FUEL Coal & Bark TEST LOAD 83 klb/hr

IMPACTOR ORIENTATION ______ FLOW THRU IMPACTOR .08 acfm ideal CFM

FLUE STATIC PRESSURE .27 inH$_2$O, VELOCITY .08" H$_2$O — 20.2 ft/sec.

NOZZLE DIA. 2 mm IMPACTOR PRESSURE DROP ______ END TIME 16:21

GAS METER END 492.235 CF START TIME 15:41

GAS METER START 490.723 CF DURATION 40

GAS VOLUME 1.512 CF FLOW RATE .0378 CFM

AMBIENT TEMPERATURE 70 °F PRESSURE 30.22 IN Hg. HUMIDITY ______ %

FLUE GAS MOLECULAR WT. ______, TEMP. 420 °F, DENSITY ______ g/cc, VISCOSITY ______ POISE

Meter Temp. 90°F Coal scale 8700 / 16:36
8649 14:40

	Stage Number							Stage Blank
	1	2	3	4	5			
Foil + Sample, g	3.6610	3.3510	3.7361	3.2852	3.7555			
Unused Foil, g	3.6600	3.3494	3.7338	3.2804	3.7537			
Sample, g	.001	.0016	.0023	.0048	.0018			
Correction for Blank, g								
Final Sample, g								

FILTER NO. x	Sample	Blank
FILTER + SAMPLE, g	0.0394	
FILTER TARE, g	0.0386	
SAMPLE, g	.0008	
CORRECTION FOR BLANK, g		
FINAL SAMPLE, g		

FULL CONTAINER, g ______

EMPTY CONTAINER, g ______

CYCLONE CATCH, g ______

KVB

BRINK IMPACTOR DATA REDUCTION

HP-67

Test No. 3-24 **Date of Test** 4-20-79 **Engineer** BUENING

Sample Location CENTER OF STACK **Conditions** ________

NOTE: Clear storage registers, then load program.

PRESS		Stage 1	2	3	4	5
STO 0	Estimated D_{50} (Stokes) diameter (CM)	.001				
STO 1	D_j = jet diameter of stage (CM)	.2490	.1775	.1396	.0946	.0731
STO 2	F_j = pressure factor of stage (N.D.)	.0210	.0273	.0395	.0903	.3277
STO 3	ρ_p = density of particles (g/CM^3)	2.5				

STO 4 μ = viscosity of flue gas (poise) 2.47×10^{-4}

STO 5 MW = molecular weight of flue gas (g/g-mole) 29.0

STO 6 ΔP_I = pressure drop across impactor (in.H_2O) 5.0

STO 7 P_S = absolute stack pressure (in. Hg) 30.30

STO 8 T_S = absolute stack temperature (°R) 880° R

STO 9 Q_S = flow rate at stack conditions (ft^3/min) .0363 12% moist.

NOTE: The following items are calculated for each Brink stage. After the first run through the program, only the first four items above need be input again for each succeeding stage.

		1	2	3	4	5
A	Calculate mean free path length, ℓ (CM)	1.5×10^{-5}	1.45×10^{-5}	1.451×10^{-5}	1.45×10^{-5}	1.45×10^{-5}
B	Calculate D_{50} (Stokes) diameter (μm)	4.097	2.399	1.623	.833	.513
C	Calculate D_{50} (Aerodynamic Impaction) diameter (μm)	6.75	4.07	2.84	1.581	1.072
D	Calculate D_{50} (Aerodynamic) diameter (μm)	6.58	3.89	2.66	1.412	.9045

DATA SHEET NO. 60-35
4/80

KVB

BRINK IMPACTOR DATA REDUCTION

HP-67

Test No. 3-28 Date of Test 4-24-79 Engineer BUENING

Sample Location Center of Stack Conditions

NOTE: Clear storage registers, then load program.

PRESS		Stage 1	2	3	4	5
STO 0	Estimated D_{50} (Stokes) diameter (CM)	.001				
STO 1	D_j = jet diameter of stage (CM)	.2490	.1775	.1396	.0946	.0731
STO 2	F_j = pressure factor of stage (N.D.)	.0210	.0273	.0395	.0903	.3277
STO 3	ρ_p = density of particles (g/CM^3)	2.5				

STO 4 μ = viscosity of flue gas (poise) 2.47×10^{-4}

STO 5 MW = molecular weight of flue gas (g/g-mole) 29.0

STO 6 ΔP_I = pressure drop across impactor (in. H_2O) 8.2

STO 7 P_S = absolute stack pressure (in. Hg) 30.22

STO 8 T_S = absolute stack temperature (°R) 880

STO 9 Q_S = flow rate at stack conditions (ft^3/min) .04234

NOTE: The following items are calculated for each Brink stage. After the first run through the program, only the first four items above need be input again for each succeeding stage.

		1	2	3	4	5
A	Calculate mean free path length, ℓ (CM)	1.455×10^{-5}	1.455×10^{-5}	1.456×10^{-5}	1.457×10^{-5}	1.464×10^{-5}
B	Calculate D_{50} (Stokes) diameter (μm)	3.78	2.208	1.490	.7588	.4622
C	Calculate D_{50} (Aerodynamic Impaction) diameter (μm)	6.25	3.764	2.625	1.463	.9917
D	Calculate D_{50} (Aerodynamic) diameter (μm)	6.07	3.589	2.452	1.294	.8232

DATA SHEET NO. 60-35
4/80

PLUME OPACITY OBSERVATION RECORD

Test Run No. 3-6

LOCATION NO. 3

OBSERVER Bruening

WNER

BOILER NO. 5

CAPACITY 100 klb/hr

DATE APR 1 3 1979

FUEL TYPE Coal, black

BURNER TYPE Stoker

POINT OF EMISSION stack

POINT OF OBSERVATION 150 yds. north of stack

TEST			Test Load	Opacity	WIND		Sky Cond.	Sun Position	Comments
No.	Time am/pm	Type	k#/hr	%	Speed mph	Direct.			
1	12:20	Partic.	80	25	10	NW	cloudy	–	
2	12:25	↓	↓	30	↓	↓	↓		
3	12:30	↓	↓	30	↓	↓	↓		
4	12:35	↓	↓	30	↓	↓	↓		
5	12:40	↓	↓	35	↓	↓	↓		
6	12:45	↓	↓	30	↓	↓	↓		
7	12:50	↓	↓	35	↓	↓	↓		
8	12:55	↓	↓	40	↓	↓	↓		
9	13:00	↓	↓	40	↓	↓	↓		
10	13:05	↓	↓	35	↓	↓	↓		
11	13:10	↓	↓	35	↓	↓	↓		
12	13:15	↓	↓	40	↓	↓	↓		
13	13:20	↓	↓	40	↓	↓	↓		
14	13:25	↓	↓	40	↓	↓	↓		
15	13:30	↓	↓	40	↓	↓	↓		
16	13:35	↓	↓	40	↓	↓	↓		

KVB

SO$_x$ DATA SHEET (GOKSOYR-ROSS METHOD)

Test No. 3-25 Date 4-20-79 Location 3

Unit No. 5 Fuel Coal & Bark (~26% Bark)

Capacity 100 K #/Hr. Unit Type Wickes W.T.

Engr. H.B. & G.Q. Conditions 65 K #/Hr.

Meter Finish 491.723

Meter Start 488.724

Sample Volume Collected = 2.999 ADCF

Start Time	Stop Time	Elapsed Time (minutes)
14:27	15:00	33

Total Sampling Time = 33 min.

Time	Meter Vac. ("Hg)	Temperatures (°F)					Sample Flow Rate (ADCFM)
		Meter	Coil In	Coil Out	Water Bath	Stack	
14:40	1.5	91				420	
14:50	2.0	91				420	

NOTES: (1) Sample flow rate at meter should be 0.075 ADCFM or 0.01 cf/8 secs.

(2) Total sample volume collected should be ~1.5 cf (~ 20 minutes sampling time).

Data Sheet KVB 6015-37

Date 6-18-79

K V B. INC.

Test No. 3-25

SOx DATA SHEET

TEST NO. 3-25 UNIT NO. 5 FUEL c/8 LOAD 65 klb/hr Location 3

Box No.					
Time					
Temp. in Gas Meter					
Press. in Gas Meter					
Meter Reading					
Barom. Press.					
Percent Oxygen					
N_2 Purge Time					

Calculation: SO_3 or SO_2, ppm = $\frac{\overset{KY}{(A - B)} \times N \times F \times (460 + T) \times 24}{V\,(P + p)}$

Excess O_2 8.8 %

	SO_2	SO_3	SO_x
A = Ml of ~~lead perchlorate~~ NaOH used for sample =	20.9	.75	
B = Ml of ~~lead perchlorate~~ NaOH used for bland =	4.5	0	
N = Normality of ~~lead perchlorate~~ NaOH titrant =	.0236	.0236	
F = Dilution factor =	10.0	1.0	
T = Average temp. in gas meter =	91	91	
V = Volume of gas sample ft^3 =	2.999	2.999	
P = Barometric pressure =	30.0	30.0	
p = Pressure in gas meter =	28.25	28.25	
Concentration, C, ppm =	604	2.8	
, gm/dscm =			
Emission, E, g/Mcal =			
lb/MBtu =			
ng/J =			
Correct.	891	4	895

$E = CF\left[\frac{2090}{20.9 - xO_2}\right]$

where

C = pollutant concentration, g/dscm

F, volume factor = ____________ dscm/10^4 cal

____________ dscf/10^4 Btu

from Fed. Reg. 9/11/74 p 32856

60-14
rev. 1/2/75

LOCATION 4 - SUBSCALE STEEL FURNACE

SUBSCALE STEEL FURNACE

Location No. 4 Unit No. —

Unit Description SUBSCALE STEEL FURNACE

- 0.61m (2ft) I.D., REFRACTORY-LINED FURNACE
- 6.1m (20ft) LONG
- CYLINDRICAL TEST SECTION
- WATER-COOLED PROBES USED TO MAINTAIN CONSTANT TEMPERATURE OF 1533K (2300°F) AT BACK OF FURNACE
- STEAM-ATOMIZED OIL TIP

Installation Date —

Heater Rating 0.6 MW (2×10^6 Btu/h)

Burner Description RADIAL / AXIAL; SCALED-DOWN VERSION OF CONVENTIONAL

Test Fuel Combinations NATURAL GAS

NO. 2 OIL

Fuel Temp. at Burner (°F) NG = AMBIENT, No. 2 Oil = AMBIENT

Primary Air Temp. (°F) AMBIENT TO 533K (500°F)

Comments: STEAM INJECTION POSSIBLE ONLY WHEN FIRING No. 2 OIL
WATER INJECTION POSSIBLE ONLY WHEN FIRING NATURAL GAS
GAS FUEL INJECTED AXIALLY THROUGH RINGS CONCENTRIC ABOUT THE OIL TIP
EMULSION ATOMIZER ON OIL GUN
OIL INJECTED RADIALLY; AIR AXIALLY

MOBILE LABORATORY DATA

Test No. 4/1-1 to 4

Test No. 4/1-1 to 4 Date JUL 12 1979 Location ______ Engr. Tidona

Unit No. ______ Fuel NG Capacity 2×10^6 Btu/h

Unit Type Research Steel Furnace Burner Type RADIAL/AXIAL

Excess O_2 variations at half capacity

1. Test No.	4/1-1		4/1-2		4/1-3		4/1-4			
2. Date										
3. Time	10:40		13:12		13:41		14:20			
4. Load (Btu/h)	1.0×10^6		→							
5. Process Rate										
6. Flue Diam. ~~or Size~~, ft	2'		→							
7. Probe Position	3' Below top of stack		→							
8. Oxygen (%)	4.17		1.90		.45		4.25			
9. NOx (hot) read/3% O_2 (ppm)	—	—	—	—	—	—	—	—		
10. NO (hot) read/3% O_2 (ppm)	—	—	—	—	—	—	—	—		
11. NO_2 (hot) read/3% O_2 (ppm)	—	—	—	—	—	—	—	—		
12. NO (cold) read/3% O_2 (ppm)	120	128	230	216	205	180	149	160		
13. Carbon Dioxide (%)	9.2		10.2		11.6		9.2			
14. Carbon Monoxide (ppm) uncor/cor	60	64	60	56	540	473	10	11		
15. Hydrocarbon (ppm) uncor/cor	—	—	—	—	—	—	—	—		
16. Sulfur Dioxide (ppm) uncor/cor	—	—	—	—	—		—	—		
17. Smoke Spot (Bacharach)	—									
18. Atmos. Temp. (°F/°C)	84		86°F		86°F		86°F			
19. Dew Point Temp. (°F/°C)	—									
20. Atmos. Pressure (in. Hg)	30.89		30.89		30.89		30.84			
21. Relative Humidity (%) } Weather	65		59		61		61			
22. Dry Bulb Temp (°F) } Station Measurements	83		85		85		85			
23.										
24.					flame					
25.	?				coming out					
26.					Stack					
27.										
28.										
29.										
30.										

MOBILE LABORATORY DATA

Test No. 4/2-1

Test No. 4/2-1 Date JUL 12 1979 Location ______ Engr. Tidon

Unit No. ______ Fuel NG Capacity 2×10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

EXCESS O_2 VARIATIONS AT FULL CAPACITY

1. Test No.	4/2-1		4/2-2		4/2-3		4/2-4			
2. Date										
3. Time	14:50		15:25		15:50		16:10			
4. Load (BTU/H)	2.0×10^6		→							
5. Process Rate										
6. Flue Diam. or Size, ft	2'		→							
7. Probe Position	3' BELOW TOP STACK		→							
8. Oxygen (%)	3.1		4.1		2.0		0.2			
9. NOx (hot) read/3% O_2 (ppm)	—	—	-							
10. NO (hot) read/3% O_2 (ppm)	—	—	-	-		-		-		
11. NO_2 (hot) read/3% O_2 (ppm)	—	—	—		-		-		-	-
12. NO (cold) read/3% O_2 (ppm)	180	181	158	168	200	189	222	192		
13. Carbon Dioxide (%)	9.9 %		8.9		10.8		11.5			
14. Carbon Monoxide (ppm) uncor/cor	23	23	10	11	60	57	360	312		
15. Hydrocarbon (ppm) uncor/cor	—	-		-		—	—		-	—
16. Sulfur Dioxide (ppm) uncor/cor	—									
17. Smoke Spot (Bacharach)	—		—		—		—		—	
18. Atmos. Temp. (°F/°C)	87°F		89°F		89°F		88°F			
19. Dew Point Temp. (°F/°C)	—		—		—		—		—	
20. Atmos. Pressure (in. Hg)	30.85		30.83		30.82		30.82			
21. Relative Humidity (%) } W.S.	65		65		61		61			
22. Dry Bulb Temp (°F) } meas.	84		84		84		84			
23.					BASELINE					
24.										
25.										
26.										
27.										
28.										
29.										
30.										

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 4/3-1 to 4

Test No. 4/3-1 to 4 Date JUL 13 1979 Location ________ Engr. TIDONA

Unit No. ________ Fuel NG Capacity 2×10^6 BTU/H

Unit Type RESEARCH STEEL Furnace Burner Type RADIAL/AXIAL

WATER INJECTION, FULL CAP. (2×10^6 BTU/h)

1. Test No.	4/3-1		4/3-1		4/3-2		4/3-3		4/3-4	
2. Date										
3. Time	11:45		12:50		13:20		13:40		14:00	
4. Load										
5. Process Rate (Btu/h)	2.0×10^6		→							
6. Flue Diam. or Size, ft	2		→							
7. Probe Position	2' BELOW STACK TOP		→							
8. Oxygen (%)	2.10		1.90		1.95		1.92		1.98	
9. NOx (hot) read/3% O_2 (ppm)*	–	–	–	–	–	–	–	–	–	–
10. NO (hot) read/3% O_2 (ppm)*	–	–	–	–	–	–	–	–	–	–
11. NO_2 (hot) read/3% O_2 (ppm)*	–	–	–	–	–	–	–	–	–	–
12. NO (cold) read/3% O_2 (ppm)*	195	186	215	203	125	118	149	141	165	156
13. Carbon Dioxide (%)	10.2		10.3		10.2		10.1		10.1	
14. Carbon Monoxide (ppm) uncor/cor*	65	62	55	52	60	57	65	61	40	39
15. Hydrocarbon (ppm) uncor/cor*	–	–	–	–	–	–	–	–	–	–
16. Sulfur Dioxide (ppm) uncor/cor*	–	–	–	–	–	–	–	–	–	–
17. Smoke Spot (Bacharach)	–		–		–		–		–	
18. Atmos. Temp. (°F/°C)	85°F		82°F		85°F		85°F		85°F	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.69		30.69		30.69		30.69		30.69	
21. Relative Humidity (%) } W.S.	82		77		77		74		74	
22. Dry Bulb Temp (°F) } meas.	77		78		78		79		79	
23.										
24.										
25.	BASELINE		BASELINE		HIGH H_2O		med-HI H_2O		MED H_2O	
26.	control									
27.	room data									
28.	not taken									
29.	conditions									
30.	changed									

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 4/3-5 to 7

Test No. 4/3-5 to 7 Date JUL 13 1978 Location ______ Engr. Tidona

Unit No. ______ Fuel NG Capacity 2 x 10^6 Btu/h

Unit Type RESEARCH STL. FURNACE Burner Type RADIAL/AXIAL

WATER INJECTION

1. Test No.	4/3-5		4/3-6		4/3-7					
2. Date	14:15									
3. Time	[illegible]		14:30		14:55					
4. Load										
5. Process Rate (Btu/h)	2.0x10^6		→		→					
6. Flue Diam. or Size, ft	2		→		→					
7. Probe Position	3' DOWN STACK TIP		→		→					
8. Oxygen (%)	2.00		2.05		1.90					
9. NOx (hot) read/3% O_2 (ppm)*										
10. NO (hot) read/3% O_2 (ppm)*										
11. NO_2 (hot) read/3% O_2 (ppm)*										
12. NO (cold) read/3% O_2 (ppm)*	175	166	195	185	220	207				
13. Carbon Dioxide (%)	10.2		9.9		10.2					
14. Carbon Monoxide (ppm) uncor/cor*	45	43	45	43	60	56				
15. Hydrocarbon (ppm) uncor/cor*	–	–	–	–						
16. Sulfur Dioxide (ppm) uncor/cor*	–	–	–	–						
17. Smoke Spot (Bacharach)	–									
18. Atmos. Temp. (°F/°C)	86° F		86° F		86° F					
19. Dew Point Temp. (°F/°C)	–									
20. Atmos. Pressure (in. Hg)	30.69		30.69		30.69					
21. Relative Humidity (%) } W.S.	74		74		74					
22. Dry Bulb Temp (°F) } meas.	79		79		78					
23.										
24.	LO H_2O		NO H_2O		BASE LINE					
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA **Test No.** 4/3-8 to 12

Test No.________ **Date** JUL 27 1979 **Location**________ **Engr.** TIDONA

Unit No.________ **Fuel** NG **Capacity** 2×10^6 Btu/hr

Unit Type RESEARCH STEEL FURNACE **Burner Type** RADIAL/AXIAL

WATER INJECTION @ 2% O_2 → Max H_2O plus Max FGR

1. Test No.	4/3-8		4/3-8		4/3-9		4/3-10		4/3-11		4/3-12	
2. Date												
3. Time	9:30		10:50		11:20		11:45		12:00		12:45	
4. Load BTU/Hr	2×10^6		2×10^6		2×10^6		2×10^6		2×10^6		2×10^6	
5. Process Rate												
6. Flue Diam. or Size, ft	2 →											
7. Probe Position	4' DOWN STACK →											
8. Oxygen (%)	2.00		2.02		2.00		2.17		2.20		1.81	
9. NOx (hot) read/3% O_2 (ppm)*	88	83	185	186	125	130	93	105	84	98	21	24
10. NO (hot) read/3% O_2 (ppm)*	88		185	186	125	130	93	105	84	98	21	24
11. NO_2 (hot) read/3% O_2 (ppm)*	0	0	0	0	0	0	0	0	0	0	0	0
12. NO (cold) read/3% O_2 (ppm)*	100	95	196	186	137	130	110	105	102	98	25	24
13. Carbon Dioxide (%)	11.4		11.1		11.3		10.1		10.1		10.6	
14. Carbon Monoxide (ppm) uncor/cor*	9	9	9	10	6	6	6	6	7	7	7	7
15. Hydrocarbon (ppm) uncor/cor*	10	10	10	10	13	13	11	13	9	11	9	11
16. Sulfur Dioxide (ppm) uncor/cor*	0	0	0	0	0	0	0	0	0	0	0	0
17. Smoke Spot (Bacharach)												
18. Atmos. Temp. (°F/°C)	81°F		83°F		84°F		84°F		84°F		84°F	
19. Dew Point Temp. (°F/°C)												
20. Atmos. Pressure (in. Hg)	29.96		29.95		29.95		29.95		29.95		29.95	
21. Relative Humidity (%) } W.S.	74		65		65		61		61		59	
22. Dry Bulb Temp (°F) } meas.	77		80		80		83		83		82	
23.												
24. FGR % RATE	0 ———										maximum	
25.	inaccurate										FGR (69%)	
26.	POINT DUE		BASELINE		2.4 gph water		3.6 gal/hr		4.8 gal/hr		4.8 gal/hr	
27.	TO INCORRECT						H_2O		H_2O		H_2O	
28.	Apparatus				CAL. LOW							
29.					ON NO							
30.												

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA **Test No.** 4/4-1-4

Test No. 4/4-1-4 **Date** 7-18-79 **Location**________ **Engr.** TIDONA

Unit No.________ **Fuel** NG **Capacity** 2 ×10⁶ Btu/hr

Unit Type RESEARCH STEEL FURNACE **Burner Type** RADIAL / AXIAL

5% FGR AT VARIOUS O_2 SETTINGS

1. Test No.	4/4-1		4/4-2		4/4-3		4/4-4			
2. Date										
3. Time	09:50		1040		1140		12:10			
4. Load (Btu/hr)	2×10⁶ →									
5. Process Rate										
6. Flue Diam. or Size, ft	2 →									
7. Probe Position	3' BELOW STACK TOP →									
8. Oxygen (%)	4.10		2.08		.25		2.05			
9. NOx (hot) read/3% O_2 (ppm)	–	—	–	-	–	—	—	—	-	—
10. NO (hot) read/3% O_2 (ppm)	—			-				–	–	-
11. NO_2 (hot) read/3% O_2 (ppm)			—	—	–		—	—	—	
12. NO (cold) read/3% O_2 (ppm)	110	117	165	157	167	162	224	213		
13. Carbon Dioxide (%)	9.4		9.2		11.7		11.3			
14. Carbon Monoxide (ppm) uncor/cor	45	48	45	43	310	302	80	76		
15. Hydrocarbon (ppm) uncor/cor	—	—	—	-			—	—	–	-
16. Sulfur Dioxide (ppm) uncor/cor	--	-	--	—			—	—	—	—
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	78° F		78° F		78° F		78° F			
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	31.03		31.03		31.00		31.00			
21. Relative Humidity (%) } W.S.	57		55		52		52			
22. Dry Bulb Temp (°F) } meas.	69		71		74		74			
23.			CO_2 CAL				BASELINE			
24.			OFF 5.5%				(NO FGR)			
25.			OF SCALE							
26. % FGR	4.9		5.1		5.4		0			
27.										
28.										
29.										
30.										

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 4/4-5 to 9

Test No. 4/4-5 to 9 Date 7-18-79 Location ________ Engr. TIDONA

Unit No. ________ Fuel NG Capacity 2×10^6 Btu/hr

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

1. Test No.	4/4-5		4/4-6		4/4-7		4/4-8		4/4-9	
2. Date										
3. Time	13:10		13:45		14:45		15:10		15:50	
4. Load (BTU)	2×10^6 →									
5. Process Rate										
6. Flue Diam. or Size, ft	2 →									
7. Probe Position	3' BELOW STACK TOP →									
8. Oxygen (%)	2.02		2.00		4.15		0.30		0.20	
9. NOx (hot) read/3% O_2 (ppm)	-	-	-	-	-	-	-	-	-	-
10. NO (hot) read/3% O_2 (ppm)	-	-	-	-	-	-	.	-	-	-
11. NO_2 (hot) read/3% O_2 (ppm)	-	-	-	-	-	.	-	.	.	-
12. NO (cold) read/3% O_2 (ppm)	188	178	108	102	70	75	86	75	290	251
13. Carbon Dioxide (%)	11.0		11.4		10.0		11.5		11.6	
14. Carbon Monoxide (ppm) uncor/cor	10	10	10	10	8	9	175	152	100	86
15. Hydrocarbon (ppm) uncor/cor	-	-	-	-	-	-	-	-	-	-
16. Sulfur Dioxide (ppm) uncor/cor	-	-	-	-	-	.	-	-	-	-
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	79°F		79°F		79°F		79°F		79°F	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.98		30.98		30.98		30.97		30.96	
21. Relative Humidity (%) w.s. meas	52		47		48		48		48	
22.	55% FGR		10.5% FGR		9.3% FGR		10.3% FGR		NO FGR	
23.									BASELINE	
24.										
25. % FGR	5.1		9.9		9.3		10.3			
26.										
27.										
28. Dry Bulb Temp (°F) w.s. meas	75		77		77		77		76	
29.										
30.										

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 4/4-10 to 14

Test No. 4/4-10 to 14 Date JUL 1 9 1979 Location ____________ Engr. TIDONA

Unit No. ________ Fuel NG Capacity 2×10^6 Btu/hr

Unit Type RES. STL. FNCE. Burner Type RADIAL/AXIAL

FGR @ 2% O_2

1. Test No.	4/4-10		4/4-11		4/4-12		4/4-13		4/4-14	
2. Date										
3. Time	9:30		11:45		14:10		14:30		15:25	
4. Load	2×10^6								→	
5. Process Rate										
6. Flue Diam. or Size, ft	2								→	
7. Probe Position	3' BELOW STACK TOP								→	
8. Oxygen (%)	2.05		2.05		2.04		1.95		2.10	
9. NOx (hot) read/3% O_2 (ppm)										
10. NO (hot) read/3% O_2 (ppm)										
11. NO_2 (hot) read/3% O_2 (ppm)										
12. NO (cold) read/3% O_2 (ppm)	55	52	295	280	48	46	40	38	325	310
13. Carbon Dioxide (%)	11.8		10.6		10.8		9.9		10.1	
14. Carbon Monoxide (ppm) uncor/cor	35	33	10	10	15	14	40	38	30	28
15. Hydrocarbon (ppm) uncor/cor										
16. Sulfur Dioxide (ppm) uncor/cor										
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	79°F		79°F		79°F		79°F		79°F	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	31.00		31.00		30.98		30.98		30.98	
21. Relative Humidity (%) } W.S.	54		47		42		43		44	
22. Dry Bulb Temp. (°F) } meas.	72		78		79		79		80	
23.	TAKEN 10 MIN		(NO RECIRC)						REPEAT	
24.	AFTER GEN.		BASELINE						BASELINE	
25.	DATA POINT									
26.										
27. % FGR	14.0% FGR		0%		15.5% FGR		19.3% FGR		0%	
28.										
29.										
30.										

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 4/4-15 to 16 4/4-22,23

Test No. 4/4-15 to 16 4/4-22,23 Date JUL 19 1979 + 7-20-79 Location ______ Engr. [illegible]

Unit No. ______ Fuel NG Capacity 2×10^6 Btu/hr

Unit Type RES. STL. FNCE Burner Type RADIAL/AXIAL

FGR @ 4% O_2

1. Test No.	4/4-15		4/4-16				4/4-22		4/4-23	
2. Date	7-19-79		7-19-79				7-20-79		7-20-79	
3. Time	16:00		16:30				13:05		13:25	
4. Load (BTU)	2×10^6 →									
5. Process Rate										
6. Flue Diam. or Size, ft	2 →									
7. Probe Position	3' FROM STACK TOP →									
8. Oxygen (%)	4.05		4.05				4.14		2.00	
9. NOx (hot) read/3% O_2 (ppm)										
10. NO (hot) read/3% O_2 (ppm)										
11. NO_2 (hot) read/3% O_2 (ppm)										
12. NO (cold) read/3% O_2 (ppm)	225	239	36	38			202	216	272	258
13. Carbon Dioxide (%)	9.5		8.9				9.2		10.6	
14. Carbon Monoxide (ppm) uncor/cor	20	21	15	16			0	0	0	0
15. Hydrocarbon (ppm) uncor/cor										
16. Sulfur Dioxide (ppm) uncor/cor										
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	79°F		79°F				83°F		83°F	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.96		30.96				30.99		30.99	
21. Relative Humidity (%) } W.S.	45		43				41		41	
22. Dry Bulb Temp. (°F) } meas.	79		79				80		80	
23. % FGR	0%		16.6				0		0	
24.										
25.										
26.							CHECK		CHECK	
27.							BASELINE		BASELINE	
28.							@ 4% O_2		@ 2% O_2	
29.										
30.										

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 4/4-17 to 21

Test No. 4/4-17 to 21 Date JUL 20 1979 Location ____ Engr. Tidona

Unit No. ____ Fuel NG Capacity 2 x 10^6 Btu/h

Unit Type RESEARCH STL. FNCE Burner Type RADIAL/AXIAL

FGR at low O_2

1. Test No.	4/4-17		4/4-18		4/4-19		4/4-20		4/4-21	
2. Date										
3. Time	10:40		11:20		11:45		12:15		12:45	
4. Load (Btu/hr)	1.9 x 10^6		2.0 x 10^6		2.0 x 10^6		2.0 x 10^6		2.0 x 10^6	
5. Process Rate										
6. Flue Diam. ~~or Size~~, ft	2'		→							
7. Probe Position	3' below top of stack		→							
8. Oxygen (%)	0.40		0.26		0.33		0.21		0.41	
9. NOx (hot) read/3% O_2 (ppm)*										
10. NO (hot) read/3% O_2 (ppm)*										
11. NO_2 (hot) read/3% O_2 (ppm)*										
12. NO (cold) read/3% O_2 (ppm)*	260	227	78	68	58	51	40	35	295	258
13. Carbon Dioxide (%)	11.3		11.4		11.2		11.3		11.4	
14. Carbon Monoxide (ppm) uncor/cor*	190	166	275	239	125	109	200	173	160	140
15. Hydrocarbon (ppm) uncor/cor*										
16. Sulfur Dioxide (ppm) uncor/cor*										
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	81°F		81°F		82°F		82°F		82°F	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	31.00		31.00		31.00		31.00		30.99	
21. Relative Humidity (%) } W. S.	42		42		41		41		41	
22. Dry Bulb Temp (°F) } meas.	80		80		81		81		80	
23.										
24.	BASELINE								REPEAT	
25.	NO FGR								BASELINE	
26.										
27. % FGR	0		10.1		12.9		17.1		0	
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 4/5-1to4

Test No. 4/5-1to4 Date JUL 23 1979 Location ______ Engr. Tidona

Unit No. ______ Fuel No.2 Oil Capacity 2×10⁶ Btu/h

Unit Type RESEARCH STL FCE Burner Type RADIAL/AXIAL

EXCESS O_2 VARIATIONS AT FULL CAPACITY

1. Test No.	4/5-1		4/5-2		4/5-3		4/5-4			
2. Date										
3. Time	14:30		14:55		15:10		15:40			
4. Load (10⁶ Btu/hr)	~1.8		~1.8		~1.8		~1.8			
5. Process Rate										
6. Flue Diam. or Size, ft	2 →									
7. Probe Position	4' DOWN STACK →									
8. Oxygen (%)	4.05		2.05		1.30		2.95			
9. NOx (hot) read/3% O_2 (ppm)*										
10. NO (hot) read/3% O_2 (ppm)*										
11. NO_2 (hot) read/3% O_2 (ppm)*										
12. NO (cold) read/3% O_2 (ppm)*	310	329	395	375	420	384	365	364		
13. Carbon Dioxide (%)	12.1		13.8		14.0		12.9			
14. Carbon Monoxide (ppm) uncor/cor*	9	10	60	57	260	238	10	10		
15. Hydrocarbon (ppm) uncor/cor*										
16. Sulfur Dioxide (ppm) uncor/cor*										
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	88°F		88°F		88°F		89°F			
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.02		30.02		30.02		30.02			
21. Relative Humidity (%) } W.S.	55		57		57		57			
22. Dry Bulb Temp (°F) } meas.	86		86		86		87			
23.			BASELINE							
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA Test No. 4/6-1 to 3

Test No. 4/6-1 to3 Date 7/23/79 Location________ Engr. TIDONA

Unit No.________ Fuel #2 OIL Capacity 2×10⁶ Btu/h

Unit Type RES. STL. FNCE. Burner Type RADIAL/AXIAL

EXCESS O_2 VARIATION AT LOW LOAD

1. Test No.	4/6-1		4/6-2		4/6-3					
2. Date										
3. Time	16:20		16:30		16:55					
4. Load (10^6 Btu/h)	~1.0		~1.1		~1.1					
5. Process Rate										
6. Flue Diam. or Size, ft	2									
7. Probe Position	4' DOWN STACK									
8. Oxygen (%)	4,10		2.15		.35					
9. NOx (hot) read/3% O_2 (ppm)*										
10. NO (hot) read/3% O_2 (ppm)*										
11. NO_2 (hot) read/3% O_2 (ppm)*										
12. NO (cold) read/3% O_2 (ppm)*	170	181	285	272	235	205				
13. Carbon Dioxide (%)	12.9		12.8		14.8					
14. Carbon Monoxide (ppm) uncor/cor*	20	21	15	14	260	227				
15. Hydrocarbon (ppm) uncor/cor*										
16. Sulfur Dioxide (ppm) uncor/cor*										
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	89°F		89°.		89°F					
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.02		30.02		30.02					
21. Relative Humidity (%) } W.S.	57		58		59					
22. Dry Bulb Temp. (°F) } meas.	87		86		85					
23.			BASELINE							
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 4/6-4 to 6 & 4/8-19

Test No.__________ Date 7-27-79 Location__________ Engr. TIDONA

Unit No.__________ Fuel #2 OIL Capacity 2 x 10^6 BTU/hr

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

VARIED O_2 @ 2 FIXED LOADS

1. Test No.	4/6-4		4/6-5		4/6-6		4/8-19			
2. Date										
3. Time	15:00		15:25		15:55		16:30			
4. Load BTU/hr	1 x 10^6		1 x 10^6		1 x 10^6		1.8 x 10^6			
5. Process Rate										
6. Flue Diam. or Size, ft	2 →									
7. Probe Position	4" DOWN STACK →									
8. Oxygen (%)	4.10		1.95		0.30		0.72			
9. NOx (hot) read/3% O_2 (ppm)*	175	226	195	232	170	191	325	288		
10. NO (hot) read/3% O_2 (ppm)*	175	226	195	232	170	191	325	288		
11. NO_2 (hot) read/3% O_2 (ppm)*	0	0	0	0	0	0	0	0		
12. NO (cold) read/3% O_2 (ppm)*	212	226	245	232	220	191	405	359		
13. Carbon Dioxide (%)	12.1		13.6		15.1					
14. Carbon Monoxide (ppm) uncor/cor*	10	11	10	9	50	43	190	169		
15. Hydrocarbon (ppm) uncor/cor*	0	0	0	0	2	2	2	2		
16. Sulfur Dioxide (ppm) uncor/cor*	—	—	—	—	—	—	—	—		
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	83°F		85°F		86°F		86°F			
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.95		29.25		29.20		29.20			
21. Relative Humidity (%) } W.S.	59		59		59		59			
22. Dry Bulb Temp (°F) } meas.	83		83		83		83			
23.	4% O_2		2% O_2		Low O_2		Low O_2			
24.							(Full Cap.)			
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 4/7-1-

Test No. 4/7-1 Date 7-24-77 Location ____ Engr. TIDONA

Unit No. ____ Fuel # 2 OIL Capacity 2×10^6 Btu/hr

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

STEAM INJECTION AT FULL LOAD

1. Test No.	4/7-1		4/7-2		4/7-3		4/7-4		4/7-4	
2. Date										
3. Time	10.20		11:45		12:20		13:30		15:00	
4. Load (10^6 BTU/H)	1.8		1.8		1.8		1.8		1.8	
5. Process Rate										
6. Flue Diam. or Size, ft	2		—		—		—		—	
7. Probe Position	4' Down STACK		—		—				—	
8. Oxygen (%)	2.00		2.05		2.07		2.00		2.03	
9. NOx (hot) read/3% O_2 (ppm)										
10. NO (hot) read/3% O_2 (ppm)										
11. NO_2 (hot) read/3% O_2 (ppm)										
12. NO (cold) read/3% O_2 (ppm)	235	223	25	24	48	47	48	45	82	78
13. Carbon Dioxide (%)	13.0		14.4		14.0		14.1		14.0	
14. Carbon Monoxide (ppm) uncor/cor	12	11	20	19	30	28	10	9	30	28
15. Hydrocarbon (ppm) uncor/cor										
16. Sulfur Dioxide (ppm) uncor/cor										
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	79°F		86°F		86°F		86°F		86°F	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.07		30.06		30.07		30.07		30.07	
21. Relative Humidity (%) } W.S.	77		77		77		90		93	
22. Dry Bulb Temp (°F) } meas.	77		77		77		73		72	
23.	BASELINE		40#/hr Stm		30#/hr steam		20#/hr steam		20#/hr steam	
24.										
25.			CO_2 TAKEN							
26.			5 MIN AFTER							
27.			DATA POINT							
28.										
29.										
30.										

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 4/7-6

Test No. 4/7-6 Date 7-24-79 Location ______ Engr. TIDOMA

Unit No. ______ Fuel #2 OIL Capacity 2×10⁶ Btu/hr

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

1. Test No.	4/7-5		4/7-6							
2. Date										
3. Time	15:10		15:30							
4. Load (x10⁶ BTU/Hr)	1.8		1.8							
5. Process Rate										
6. Flue Diam. or Size, ft	2									
7. Probe Position	4' BELOW STACK									
8. Oxygen (%)	2.10		2.07							
9. NOx (hot) read/3% O_2 (ppm)*										
10. NO (hot) read/3% O_2 (ppm)*										
11. NO_2 (hot) read/3% O_2 (ppm)*										
12. NO (cold) read/3% O_2 (ppm)*	148	141	285	271						
13. Carbon Dioxide (%)	14.0		13.2							
14. Carbon Monoxide (ppm) uncor/cor*	25	24	25	24						
15. Hydrocarbon (ppm) uncor/cor*										
16. Sulfur Dioxide (ppm) uncor/cor*										
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	86°F		86°F							
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.06		30.06							
21. Relative Humidity (%) } W.S.	93		93							
22. Dry Bulb Temp (°F) } meas.	72		73							
23. lbs. STEAM INJECTED	10.5		BASELINE							
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA   Test No. 4|8·1 to 5

Test No. 4|8-1   Date JUL 25 1979   Location ________   Engr. TIDONA

Unit No. ________   Fuel No.2 Oil   Capacity 2 x10⁶ Btu/hr

Unit Type RESEARCH STEEL FURNACE   Burner Type RADIAL / AXIAL

VARIED FGR AT 4% O_2

1. Test No.	4/8-1		4/8-2		4/8-3		4/8-4		4/8-5	
2. Date										
3. Time	10:45		11:55		12:45		13:20		14:00	
4. Load (x10⁶ BTU/Hr)	1.8		→							
5. Process Rate										
6. Flue Diam. or Size, ft	2		→							
7. Probe Position	4' Down STACK		→							
8. Oxygen (%)	3.97		3.98		4.00		4.00		4.10	
9. NOx (hot) read/3% O_2 (ppm)*	200	243	90	116	120	149	60	76	60	72
10. NO (hot) read/3% O_2 (ppm)*	200	243	90	116	120	149	60	76	60	72
11. NO_2 (hot) read/3% O_2 (ppm)*	0	0	0	0	0	0	0	0	0	0
12. NO (cold) read/3% O_2 (ppm)*	230	243	110	116	140	149	72	76	68	72
13. Carbon Dioxide (%)	12.5		13.6		13.6		12.5		11.9	
14. Carbon Monoxide (ppm) uncor/cor*	10	11	10	11	10	11	10	11	10	11
15. Hydrocarbon (ppm) uncor/cor*	18	22	15	20	15	19	20	25	18	22
16. Sulfur Dioxide (ppm) uncor/cor*	280	340	164	212	210	259	180	229	170	205
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	83°F		85°F		85°F		86°F		86°F	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.87		29.84		29.84		29.85		29.84	
21. Relative Humidity (%) } W.S.	91		85		85		85		91	
22. Dry Bulb Temp (°F) } meas.	76		78		79		79		76	
23.										
24.										
25. FGR % RATE	0		9.0		5.4		15.6		15.9	
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 4/8-6 to 10

Test No. 4/8-6 to10 Date 7-25-79 Location ______ Engr. TIDONA

Unit No. ______ Fuel No. 2 oil Capacity 2 x 10^6 Btu/hr

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

FGR @ 2% O2

1. Test No.	4/8-6		4/8-7		4/8-8		4/8-9		4/8-10	
2. Date							7-26-79		7-26-79	
3. Time	14:35		15:05		15:55		11:05		11:45	
4. Load (X 10^6 BTU/Hr)	1.8 →									
5. Process Rate										
6. Flue Diam. or Size, ft	2 →									
7. Probe Position	4' DOWN STACK →									
8. Oxygen (%)	4.00		2.10		2.00		2.10		1.95	
9. NOx (hot) read/3% O_2 (ppm)*	180	233	190	219	58	66	220	246	52	57
10. NO (hot) read/3% O_2 (ppm)*	180	233	190	219	58	66	220	246	52	57
11. NO_2 (hot) read/3% O_2 (ppm)*	0	0	0	0	0	0	0	0	0	0
12. NO (cold) read/3% O_2 (ppm)*	220	233	230	219	70	66	258	246	60	57
13. Carbon Dioxide (%)	14.1		13.0		13.4		14.8		14.2	
14. Carbon Monoxide (ppm) uncor/cor*	10	11	11	10	10	9	8	8	9	9
15. Hydrocarbon (ppm) uncor/cor*	14	18	20	23	6	7	17	19	5	6
16. Sulfur Dioxide (ppm) uncor/cor*	220	285	205	236	238	272	210	235	234	257
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	83°F		83°F		83°F		83°F		83°F	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.82		29.82		29.82		29.89		28.90	
21. Relative Humidity (%) } W.S.	88		88		82		74		67	
22. Dry Bulb Temp. (°F) } meas.	79		79		79		74		75	
23.										
24. FGR % RATE	BASELINE		BASELINE		18.0%FGR		BASELINE		21.2%FGR	
25. O_2 % POINT	4% O_2		2% O_2		2% O_2		2% O_2		2% O_2	
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 4/8-11 to 15

Test No. 4/8-11 to 15 Date JUL 26 1979 Location ______ Engr. ______

Unit No. ______ Fuel No. 2 Oil Capacity 2×10^6 Btu/hr

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

	FGR @ 2% O_2 →						FGR @ low O_2 →			
1. Test No.	4/8-11		4/8-12		4/8-13		4/8-14		4/8-15	
2. Date										
3. Time	12:10		12:35		13:45		14:15		14:45	
4. Load ($\times 10^6$ BTU/Hr)	1.8 →									
5. Process Rate										
6. Flue Diam. or Size, ft	2 →									
7. Probe Position	4' Down STACK →									
8. Oxygen (%)	2.10		2.10		1.75		0.90		0.60	
9. NOx (hot) read/3% O_2 (ppm)*	77	90	103	124	125	140	165	181	56	55
10. NO (hot) read/3% O_2 (ppm)*	77	90	103	124	125	140	165	181	56	55
11. NO_2 (hot) read/3% O_2 (ppm)*	0	0	0	0	0	0	0	0	0	0
12. NO (cold) read/3% O_2 (ppm)*	95	90	130	124	150	140	192	181	62	55
13. Carbon Dioxide (%)	14.3		14.3		15.0		15.4		15.2	
14. Carbon Monoxide (ppm) uncor/cor*	9	9	9	9	10	9	115	103	150	132
15. Hydrocarbon (ppm) uncor/cor*	10	12	10	13	8	8	13	14	–	–
16. Sulfur Dioxide (ppm) uncor/cor*	180	211	260	313	210	235	260	271	264	258
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	81°F		81°F		83°F		83°F		83°F	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.90		29.90		29.92		29.92		29.92	
21. Relative Humidity (%) } W.S.	67		71		67		67		64	
22. Dry Bulb Temp (°F) } meas.	75		74		77		77		76	
23.										
24. FGR % RATE	14.7		10.2		5.3		6.1		19.8	
25.										
26. O_2 % POINT	2%		2%		2%		low		low	
27.							(CO limit)		→	
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 4/8-16 to 18

Test No. 4/8-16 to 18 Date 7-26-79 Location _____ Engr. TIDONA

Unit No. _____ Fuel #2 OIL Capacity 2 x 10^6 BTU/Hr

Unit Type RESEARCH STEEL Furnace Burner Type RADIAL / AXIAL

1. Test No.	4/8-16		4/8-17		4/8-18		4/8-19			
2. Date							7-27-79			
3. Time	15:20		15:55		16:25		16:30			
4. Load (x10^6 BTU/Hr.)	1.8 →									
5. Process Rate										
6. Flue Diam. or Size, ft	2 →									
7. Probe Position	4' DOWN STACK →									
8. Oxygen (%)	0.60		0.65		0.80		0.72			
9. NOx (hot) read/3% O_2 (ppm)*	71	77	103	109	315	339	325	359		
10. NO (hot) read/3% O_2 (ppm)*	71	77	103	109	315	339	325	359		
11. NO_2 (hot) read/3% O_2 (ppm)*	0	0	0	0	0	0	0	0		
12. NO (cold) read/3% O_2 (ppm)*	87	77	123	109	380	339	405	359		
13. Carbon Dioxide (%)	14.9		14.9		14.8					
14. Carbon Monoxide (ppm) uncor/cor*	290	256	390	345	390	339	190	169		
15. Hydrocarbon (ppm) uncor/cor*	15	16	16	17	15	16	2	2		
16. Sulfur Dioxide (ppm) uncor/cor*	260	319	300	316	260	280	–	–		
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	83°F		83°F		83°F		86°F			
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.92		29.92		29.92		29.20			
21. Relative Humidity (%) } W.S.	64		69		69		59			
22. Dry Bulb Temp (°F) } meas.	76		77		77		83			
23.										
24. FGR % RATE	16.8		10.0		0		0			
25.										
26. O_2 % POINT	LOW O_2		LOW O_2		LOW O_2		LOW O_2			
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 4/9-1 TO 3 4/10-1 to 2

Test No. 4/9-1 **Date** JUL 31 1979 **Location** ______ **Engr.** TIDONA

Unit No. ______ **Fuel** NG **Capacity** 2.0 x 10⁶ Btu/hr

Unit Type RESEARCH Steel FURNACE **Burner Type** RADIAL / AXIAL

FLAME PROFILE - FULL LOAD → | FLAME PROFILE - LOW LOAD

1. Test No.	4/9-1		4/9-2		4/9-3		4/10-1		4/10-2	
2. Date	7-31-79		→							
3. Time	9:30		10:30		11:05		11:55		12:40	
4. Load (x 10⁶ BTU/hr)	2.0		2.0		2.0		1.0		1.0	
5. Process Rate										
6. Flue Diam. or Size, ft	2		→							
7. Probe Position	4' DOWN STACK		→							
8. Oxygen (%)	3.90		2.15		0.55		4.10		2.00	
9. NOx (hot) read/3% O_2 (ppm)*	92	126	142	172	170	185	110	149	153	180
10. NO (hot) read/3% O_2 (ppm)*	92	126	142	172	170	185	110	149	153	180
11. NO_2 (hot) read/3% O_2 (ppm)*	0	0	0	0	0	0	0	0	0	0
12. NO (cold) read/3% O_2 (ppm)*	120	126	180	172	210	185	140	149	190	180
13. Carbon Dioxide (%)	9.5		10.6		11.4		9.9		11.0	
14. Carbon Monoxide (ppm) uncor/cor*	3	3	5	5	70	80	2	2	2	2
15. Hydrocarbon (ppm) uncor/cor*	0	0	4	5	4	4	2	3	2	2
16. Sulfur Dioxide (ppm) uncor/cor*	0	0	0	0	0	0	0	0	0	0
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	81°F		82°F		82°F		83°F		83°F	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.88		29.88		29.88		29.90		29.91	
21. Relative Humidity (%) } W.S.	~~95~~ 85		~~95~~ 82		~~95~~ 82		~~95~~ 82		~~87~~ 74	
22. Dry Bulb Temp (°F) } meas.	76		77		77		76		80	
23.										
24. O_2 DESIGN	HIGH		med		low		HIGH		MED	
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 4/10-3 4/11-1 to 3

Test No. 4/10-3 4/11-1 to 3 Date 7-31-79 Location ______ Engr. TIDONA

Unit No. ______ Fuel NG Capacity 2.0 x 10^6 Btu/hr

Unit Type RESEARCH STEEL FURNACE Burner Type AXIAL/RADIAL

FLAME PROFILE TESTS LOW LOAD | WATER INJ. → | BASELINE - FULL LOAD

1. Test No.	4/10-3		4/11-1		4/11-2		4/11-3			
2. Date										
3. Time	13:05		14:35		15:05		15:30			
4. Load (x10^6 Btu/hr)	1.0		2.0		2.0		2.0			
5. Process Rate										
6. Flue Diam. or Size, ft	2 →									
7. Probe Position	4' DOWN STACK →									
8. Oxygen (%)	0.40		1.97		2.00		1.90			
9. NOx (hot) read/3% O_2 (ppm)*	150	179	135	180	85	116	180	221		
10. NO (hot) read/3% O_2 (ppm)*	150	179	135	180	85	116	180	221		
11. NO_2 (hot) read/3% O_2 (ppm)*	0	0	0	0	0	0	0	0		
12. NO (cold) read/3% O_2 (ppm)*	205	179	190	180	122	116	235	221		
13. Carbon Dioxide (%)	12.0		11.0		11.0		11.0			
14. Carbon Monoxide (ppm) uncor/cor*	150	131	5	5	5	5	5	5		
15. Hydrocarbon (ppm) uncor/cor*	2	2	4	4	2	2	2	2		
16. Sulfur Dioxide (ppm) uncor/cor*	0	0	0	0	0	0	0	0		
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	83°F		86°F		86°F		86°F			
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.92		29.92		29.92		29.92			
21. Relative Humidity (%) } W.S.	~~87~~ 74		~~87~~ 74		~~87~~ 74		~~87~~ 74			
22. Dry Bulb Temp. (°F) } meas.	80		82		83		83			
23. H_2O INJECT RATE	—		2.4 gl/hr		4.8 gl/hr		BASELINE			
24. FGR % RATE	—		—		—		—			
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 4/12-1

Test No. 4/12-1 Date 8-1-79 Location ____ Engr. TIDONA

Unit No. ____ Fuel NG Capacity 2.0 x 10^6 Btu/hr

Unit Type RESEARCH STL FRNCE Burner Type RADIAL AXIAL

FLAME PROFILE TEST - FGR

1. Test No.	4/12-1		4/12-2							
2. Date										
3. Time	09:25		10:30							
4. Load (x10^6 Btu/hr)	2.0		2.0							
5. Process Rate										
6. Flue Diam. or Size, ft	2 →									
7. Probe Position	4' Down stack →									
8. Oxygen (%)	1.90		2.00							
9. NOx (hot) read/3% O_2 (ppm)*										
10. NO (hot) read/3% O_2 (ppm)*										
11. NO_2 (hot) read/3% O_2 (ppm)*										
12. NO (cold) read/3% O_2 (ppm)*	212	200	55	52						
13. Carbon Dioxide (%)	11.0		10.6							
14. Carbon Monoxide (ppm) uncor/cor*	10	9	4	4						
15. Hydrocarbon (ppm) uncor/cor*										
16. Sulfur Dioxide (ppm) uncor/cor*										
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	82°F		83°F							
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.95		29.95							
21. Relative Humidity (%) } W.S.	81		74							
22. Dry Bulb Temp (°F)) meas.	71		74							
23.										
24. FGR % RATE	BASELINE		12.6%							
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 4/13-1 to 3

Test No. 4/13-1 to 3 Date 8-1-79 Location ______ Engr. TIDONA

Unit No. ______ Fuel #2 OIL Capacity 1.8×10^6 Btu/hr

Unit Type RESRCH Stl Furnce Burner Type RADIAL/AXIAL

EXCESS O_2 VARIATIONS @ LOW LOAD - Flame Profile Tests

1. Test No.	4/13-1		4/13-2		4/13-3					
2. Date										
3. Time	11:50		12:35		13:05					
4. Load ($\times 10^6$ Btu/hr)	1.0		1.0		1.0					
5. Process Rate										
6. Flue Diam. or Size, ft	2		→							
7. Probe Position	4' DOWN STACK		→							
8. Oxygen (%)	4.10		1.97		0.40					
9. NOx (hot) read/3% O_2 (ppm)*										
10. NO (hot) read/3% O_2 (ppm)*										
11. NO_2 (hot) read/3% O_2 (ppm)*										
12. NO (cold) read/3% O_2 (ppm)*	235	250	320	303	295	258				
13. Carbon Dioxide (%)	12.3		14.1		15.6					
14. Carbon Monoxide (ppm) uncor/cor*	5	5	5	5	45	39				
15. Hydrocarbon (ppm) uncor/cor*										
16. Sulfur Dioxide (ppm) uncor/cor*										
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	83°F		84°F							
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.95		29.95		29.95					
21. Relative Humidity (%) } W.S.	85		88		88					
22. Dry Bulb Temp (°F) } meas.	74		74		74					
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA **Test No.** 4/14 - 1 to 3

Test No.________ **Date** 8-1-79 **Location**________ **Engr.** TIDONA

Unit No.________ **Fuel** #2 OIL **Capacity** 1.8 X10^6 Btu/hr

Unit Type RESRCH Stl FURNCE **Burner Type** RADIAL /AXIAL

VARIED O_2 @ HIGH LOAD

1. Test No.	4/14-1		4/14-2		4/14-3					
2. Date										
3. Time	14:25		14:45		15:15					
4. Load (x10^6 Btu/hr	1.8		1.8		1.8					
5. Process Rate										
6. Flue Diam. or Size, ft	2 ⟶									
7. Probe Position	4' down stack ⟶									
8. Oxygen (%)	4.00		2.00		1.15					
9. NOx (hot) read/3% O_2 (ppm)*										
10. NO (hot) read/3% O_2 (ppm)*										
11. NO_2 (hot) read/3% O_2 (ppm)*										
12. NO (cold) read/3% O_2 (ppm)*	290	307	395	374	390	354				
13. Carbon Dioxide (%)	12.0		13.2		13.6					
14. Carbon Monoxide (ppm) uncor/cor*	5	5	40	38	400	362				
15. Hydrocarbon (ppm) uncor/cor*										
16. Sulfur Dioxide (ppm) uncor/cor*										
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	82°F		81°F		81°F					
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.95		29.92		29.90					
21. Relative Humidity (%) } W.S.	88		91		91					
22. Dry Bulb Temp (°F) } meas.	74		73		73					
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

FLAME PROFILE:

MOBILE LABORATORY DATA **Test No.** 4/15-1 to 2

Test No. 4/15-1 to 2 **Date** 8-2-79 **Location**______ **Engr.** TIDOMA

Unit No.______ **Fuel** #2 OIL **Capacity** 1.8 X 10⁶ Btu/hr

Unit Type RESERCH 8EC FRNCE **Burner Type** RADIAL / AXIAL

Steam INJECTION

1. Test No.	4/15-1		4/15-2							
2. Date										
3. Time	13:40		14:15							
4. Load (x10⁶ Btu/hr)	1.8									
5. Process Rate										
6. Flue Diam. or Size, ft	2 →									
7. Probe Position	4' Down Stack →									
8. Oxygen (%)	1.90		2.05							
9. NOx (hot) read/3% O_2 (ppm)*										
10. NO (hot) read/3% O_2 (ppm)*										
11. NO_2 (hot) read/3% O_2 (ppm)*										
12. NO (cold) read/3% O_2 (ppm)*	278	262	55	52						
13. Carbon Dioxide (%)	13.6		13.7							
14. Carbon Monoxide (ppm) uncor/cor*	40	38	100	95						
15. Hydrocarbon (ppm) uncor/cor*										
16. Sulfur Dioxide (ppm) uncor/cor*										
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	82°F		82°F							
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.89		29.89							
21. Relative Humidity (%) } W.S.	64		64							
22. Dry Bulb Temp (°F) } meas	77		77							
23.	BASELINE									
24. STEAM INJECT RATE	—		40 lb/hr							
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

FLAME PROFILE

MOBILE LABORATORY DATA

Test No. 4/16-1 & 2

Test No. ________ **Date** AUG 2 1979 **Location** ________ **Engr.** TIDONA

Unit No. ________ **Fuel** #2 OIL **Capacity** 1.8 x 10^6 Btu/hr

Unit Type RESEARCH STL. FURNACE **Burner Type** RADIAL/AXIAL

15% FGR @ 2% O_2 - FLAME PROFILE TEST

1. Test No.	4/16-1		4/16-2							
2. Date										
3. Time	9:35		12:10							
4. Load (x10^6 Btu/hr)	1.8 →		→		→		→		→	
5. Process Rate										
6. Flue Diam. or Size, ft	2 →		→		→		→		→	
7. Probe Position	4' DOWN STACK →		→		→		→		→	
8. Oxygen (%)	2.00		2.00							
9. NOx (hot) read/3% O_2 (ppm)*										
10. NO (hot) read/3% O_2 (ppm)*										
11. NO_2 (hot) read/3% O_2 (ppm)*										
12. NO (cold) read/3% O_2 (ppm)*	262	248	100	95						
13. Carbon Dioxide (%)	14.0		14.0							
14. Carbon Monoxide (ppm) uncor/cor*	15	14	10	9						
15. Hydrocarbon (ppm) uncor/cor*										
16. Sulfur Dioxide (ppm) uncor/cor*										
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	77°F		80°F							
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.86		29.88							
21. Relative Humidity (%) } W.S.	74		67							
22. Dry Bulb Temp (°F) } meas.	73		76							
23.	BASLINE		12.9% FGR							
24.										
25.			SO_x							
26.			Test							
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

UNIT OPERATING DATA

Test No. 711-110

Test No. 4/1-1 to 4 Date JUL 12 1979 Location ____ Engr. Tidona

Unit No. ____ Fuel NG Capacity 2×10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

EXCESS O_2 VARIATIONS AT HALF LOAD GAS= 998.1 Btu/ft³ dry

1. Test Number	4/1-1	4/1-2	4/1-3	4/1-4	
2. Date					
3. Time	10:40	13:12	13:41	14:20	
4. Load (Btu/h)	1.0×10^6	1.0×10^6	1.0×10^6	1.0×10^6	
5. Process Rate					
6. Comb. Air Temp (°F)	90	90	90	90	
7. Comb. Air Press (iwg)	0.3	0.1	0.1	0.15	
8. Comb. Air Flow (SCFH)	12500	11000	10010	12400	
9. Fuel Temp (°F)	80	80	80	80	
10. " Press (iwg)	0.2	0.2	0.2	0.15	
11. " Flow (SCFH)	1025	1020	1020	1020	
12. Steam Temp. (°F)					
13. " Press. ( )					
14. " Flow ( )					
15. Water Temp. ( )					
16. " Press. ( )					
17. " Flow ( )					
18. Atomizing Air Temp ( )					
19. " " Press ( )					
20. " " Flow ( )					
21. Recirc. Temp ( )					
22. " Press. ( )					
23. " Flow ( )					
24. Control Rm. O_2 (%)	4.3	1.9	0.1	4.2	
25. Furnace Temp (°F)	2165	2346	2410	2071	
26.					
27.					
28.					
29.					
30.					

Data Sheet 6002-1

Test No. 4/2-1 to 4 Date 7-12-79 Location ______ Engr. Tidona

Unit No. ______ Fuel NG Capacity 2×10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

EXCESS O_2 VARIATIONS AT FULL LOAD

1. Test Number	4/2-1	4/2-2	4/2-3	4/2-4	
2. Date					
3. Time	14:50	15:25	15:50	16:10	
4. Load (Btu/h)	2.0×10^6	2.0×10^6	2.0×10^6	2.0×10^6	
5. Process Rate					
6. Comb. Air Temp (°F)	90	90	90	90	
7. " " Press (iwg)	0.4	0.5	0.6	0.6	
8. " " Flow (SCFH)	23000	24500	22000	19500	
9. Fuel Temp (°F)	80	80	80	80	
10. " Press (iwg)	0.65	0.65	0.7	0.7	
11. " Flow (SCFH)	2000	2000	2000	2000	
12. Steam Temp (°F)					
13. " Press (psig)					
14. " Flow (lb/h)					
15. Water Temp (°F)					
16. " Press (psig)					
17. " Flow (gal/h)					
18. Atomizing Air Temp (°F)					
19. " " Press (psig)					
20. " " Flow (SCFH)					
21. Recirc. gas Temp (°F)					
22. " " Press (iwg)					
23. " " Flow (SCFH)					
24. Control Rm. O_2 (%)	35	4.3	1.8	0.5	
25. Furnace Temp (°F)	2325	2282	2380	2428	
26.					
27.					
28.					
29.					
30.					

Data Sheet 6002-1

Test No. 4/3-1 to 5 Date MAR. 13 1979 Location ________ Engr. Tidona

Unit No. ________ Fuel NG Capacity 2×10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

WATER INJECTION @ FULL CAP. (2×10^6 Btu/h) – CONST. ATOM. AIR PRESS

1. Test Number	4/3-1	4/3-2	4/3-3	4/3-4	4/3-5
2. Date					
3. Time	12:50	13:20	13:45	14:00	14:15
4. Load					
5. Process Rate (Btu/h)	2.0×10^6	→			
6. Comb. Air Temp (°F)	90	90	90	90	90
7. " " Press (iwg)	0.5	0.5	0.5	0.5	0.5
8. " " Flow (SCFH)	21500	21500	21500	21500	21500
9. Fuel Temp (°F)	80	80	80	80	80
10. " Press (iwg)	0.7	0.7	0.7	0.7	0.7
11. " Flow (SCFH)	2000	2000	2000	2000	2000
12. Steam Temp (°F)		–	–	–	–
13. " Press (psig)		–	–	–	–
14. " Flow (lb/h)		–	–	–	–
15. Water Temp (°F)		64	64	64	64
16. " Press (psig)		5	5	4	3
17. " Flow (gal/h)		2.4	1.8	1.2	0.6
18. Atomizing Air Temp (°F)		70	70	70	70
19. " " Press (psig)		20	20	20	20
20. " " Flow (SCFH)		550	550	550	560
21. Recirc. gas Temp (°F)		–	–	–	–
22. " " Press (iwg)		–	–	–	–
23. " " Flow (SCFH)		–	–	–	–
24. Control Rm. O_2 (%)	I.O.O.S.	I.O.O.S.	I.O.O.S.	I.O.O.S.	I.O.O.S
25. Furnace Temp (°F)	2265	2275	2270	2280	2300
26.					
27.	BASELINE	HIGH H_2O	HI-MED H_2O	MED H_2O	LO H_2O
28.		(2.4 gph)	(1.8 gph)	(1.2 gph)	(0.6 gph)
29.		~20% of fuel	~15% of $\dot{m}_f$	~10% of $\dot{m}_f$	~5% of $\dot{m}_f$
30.		mass flow rate			

Data Sheet 6002-1

Test No. 4/3-6 Date JUL 1 3 1979 Location ______ Engr. Tidona

nit No. ______ Fuel NG Capacity 2×10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

1. Test Number	4/3-6	4/3-7			
2. Date					
3. Time	14:30	14:55			
4. Load (Btu/h)	2.0×10^6	→			
5. Process Rate					
6. Comb. Air Temp (°F)	90	90			
7. " " Press (iwg)	0.5	0.5			
8. " " Flow (SCFH)	21500	21500			
9. Fuel Temp (°F)	80	80			
10. " Press (iwg)	0.7	0.7			
11. " Flow (SCFH)	2000	2000			
12. Steam Temp (°F)					
13. " Press (psig)					
14. " Flow (lb/h)					
15. Water Temp (°F)					
16. " Press (psig)					
17. " Flow (gal/h)					
18. Atomizing Air Temp (°F)	70				
19. " " Press (psig)	20				
20. " " Flow (SCFH)	540				
21. Recirc. gas Temp (°F)					
22. " " Press (iwg)					
23. " " Flow (SCFH)					
24. Control Rm. O_2 (%)	I.O.O.S.	I.O.O.S			
25. Furnace Temp (°F)	2305	2299			
26.					
27.	NO H_2O	REPEAT			
28.	ONLY ATOM.	BASELINE			
29.	AIR				
30.					

Data Sheet 6002-1

Test No. 4/3-8 to 12 **Date** JUL 27 1979 **Location** ______ **Engr.** Tidona

Unit No. ______ **Fuel** NG **Capacity** 2 x 10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE **Burner Type** RADIAL/AXIAL

Water Injection; Water + FGR

1. Test Number	4/3-8	4/3-9	4/3-10	4/3-11	4/3-12
2. Date	7-27	→			
3. Time	10:52	11:20	11:45	12:05	12:45
4. Load (Btu/hr)	2.0×10^6	→			
5. Process Rate					
6. Comb. Air Temp (°F)	109°	110	109	110	182
7. " " Press (iwg)	2.3	2.2	2.3	2.3	5.0
8. " " Flow (SCFH)	21,500	21500	21500	21500	18500
9. Fuel Temp (°F)	80°	80	80	80	80
10. " Press	1.3	1.3	1.2	1.2	1.2
11. " Flow (SCFH)	2000	2000	2000	2000	2000
12. Steam Temp (°F)	—	—	-	—	—
13. " Press (psig)	—	—	-	—	-
14. " Flow (lb/h)	—	—	-	—	-
15. Water Temp (°F)	—	70	70	70	70
16. " Press (psig)	—	?	?	?	?
17. " Flow (gal/h)	—	2.4	3.6	4.8	4.8
18. Atomizing Air Temp (°F)	—	—	—	—	—
19. " " Press (psig)	—	—	—	—	—
20. " " Flow (SCFH)	—	—	-	—	-
21. Recirc. gas Temp (°F)	—	—	—	-	434
22. " " Press (iwg)	—	—	-	—	9.5
23. " " Flow (SCFH)	—	—	-	—	7400
24. Control Rm. O_2 (%)	N/A	N/A	N/A	N/A	N/A
25. Furnace Temp (°F)	2332°	2333	2320	2300	2340
26. FGR O_2 (%)	—	—	—	—	9.7
27. FGR rate (%)	0	0	0	0	16.9
28.	BASELINE	2.4 gph H_2O	3.6 gph H_2O	4.8 gph H_2O	4.8 gph H_2O
29.					+FGR
30.					

Data Sheet 6002-1

Test No. 4/4-1 to 4 **Date** 7-18-79 **Location** ______ **Engr.** Tidona

Unit No. ______ **Fuel** NG **Capacity** 2 × 10⁶ Btu/h

Unit Type RESEARCH STEEL FURNACE **Burner Type** RADIAL/AXIAL

5% FGR AT VARIOUS O_2 SETTINGS

1. Test Number	4/4-1	4/4-2	4/4-3	4/4-4	
2. Date	7-18-79	7-18-79	7-18-79	7-18-79	
3. Time	09:50	10:50	11:32	12:12	
4. Load (Btu/hr)	2.0×10^6	2.0×10^6	2.0×10^6	2.0×10^6	
5. Process Rate	—	—	—	—	
6. Comb. Air Temp (°F)	109	114	116	112	
7. " " Press (iwg)	2	1.8	1.3	1.3	
8. " " Flow (SCFH)	24000	21500	20,000	21500	
9. Fuel Temp (°F)	70	70	70	70	
10. " Press (iwg)	1.2	1.2	1.1	1.2	
11. " Flow (SCFH)	1950	2000	2000	2000	
12. Steam Temp (°F)	—	—	—	—	
13. " Press (psig)	—	—	—	—	
14. " Flow (lb/h)	—	—	—	—	
15. Water Temp (°F)	—	—	—	—	
16. " Press (psig)	—	—	—	—	
17. " Flow (gal/h)	—	—	—	—	
18. Atomizing Air Temp (°F)	—	—	—	—	
19. " " Press (psig)	—	—	—	—	
20. " " Flow (SCFH)	—	—	—	—	
21. Recirc. gas Temp (°F)	295	262	273	NO FGR	
22. " " Press (iwg)	10.6	11.0	11.1	"	
23. " " Flow (SCFH)	1250	1200	1200	"	
24. Control Rm. (Stack) O_2 (%)	N/A	N/A	N/A	N/A	
25. Furnace Temp (°F)	2330	2325	2335	2325	
26. FGR O_2 (%)	4.6	2.9	1.65	—	
27. % FGR	4.9	5.1	~~5.1~~ 5.4	—	
28.					
29.				BASELINE	
30.				(NO FGR)	

Data Sheet 6002-1

Test No. 4/4-5 to 9 **Date** JUL 18 1979 **Location** **Engr.** Tidona

Unit No. **Fuel** NG **Capacity** 2 × 10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE **Burner Type** RADIAL / AXIAL

10% FGR AT VARIOUS O_2 SETTINGS

1. Test Number	4/4-5	4/4-6	4/4-7	4/4-8	4/4-9
2. Date	7-18-79	7-18-79	7-18-79	7-18-79	7-18-79
3. Time	13:15	13:45	14:45	15:20	15:50
4. Load	2.0 × 10^6	2.0 × 10^6	2.0 × 10^6	2.0 × 10^6	2.0 × 10^6
5. Process Rate					
6. Comb. Air Temp (°F)	120	136	139	145	120
7. " " Press (iwg)	1.6	1.9	2.0	2.1	1.2
8. " " Flow (SCFH)	21500	21500	23500	20000	20000
9. Fuel Temp (°F)	70	70	70	70	70
10. " Press (inH$_2$O)	1.15	1.2	1.2	1.2	1.2
11. " Flow (SCFH)	2000	2000	2000	2000	2000
12. Steam Temp (°F)	–	–	–	–	–
13. " Press (psig)	–	–	–	–	–
14. " Flow (lb/h)	–	–	–	–	–
15. Water Temp (°F)	–	–	–	–	–
16. " Press (psig)	–	–	–	–	–
17. " Flow (gal/h)	–	–	–	–	–
18. Atomizing Air Temp (°F)	–	–	–	–	–
19. " " Press (psig)	–	–	–	–	–
20. " " Flow (SCFH)	–	–	–	–	–
21. Recirc. gas Temp (°F)	282	380	409	419	–
22. " " Press (iwg)	11.0	10.0	10.0	9.4	–
23. " " Flow (SCFH)	1200	2450	2450	2500	–
24. Control Rm. O_2 (%)	N/A	N/A	N/A	N/A	N/A
25. Furnace Temp (°F)	2265	2240	2213	2360	2382
26. FGR O_2 (%)	2.9	2.9	4.6	2.1	–
27. FGR rate (%)	~~5.5~~ 5.1	~~10.5~~ 9.9	9.3	~~10.4~~ 10.3	0
28.					BASELINE
29.					(NO FGR)
30.					

Test No. 4/4-10 to 14 Date JUL 19 1979 Location ________ Engr. Tidona

Unit No. ________ Fuel NG Capacity 2×10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

FGR AT 2% O_2

1. Test Number	4/4-10	4/4-11	4/4-12	4/4-13	4/4-14
2. Date					
3. Time	09:30	11:45	14:10	14:30	15:25
4. Load	2.0×10^6	2.0×10^6	2.0×10^6	2.0×10^6	2.0×10^6
5. Process Rate					
6. Comb. Air Temp (°F)	139	114	176	201	118
7. " " Press (iwg)	2.5	1.2	3.0	3.6	1.6
8. " " Flow (SCFH)	21000	21500	19500	19000	22000
9. Fuel Temp (°F)	70	70	70	70	70
10. " Press (iwg)	1.2	1.2	1.2	1.2	1.3
11. " Flow (SCFH)	2000	2000	2000	2000	2000
12. Steam Temp (°F)	–	–	–	–	–
13. " Press (psig)	–	–	–	–	–
14. " Flow (lb/h)	–	–	–	–	–
15. Water Temp (°F)	–	–	–	–	–
16. " Press (psig)	–	–	–	–	–
17. " Flow (gal/h)	–	–	–	–	–
18. Atomizing Air Temp (°F)	–	–	–	–	–
19. " " Press (psig)	–	–	–	–	–
20. " " Flow (SCFH)	–	–	–	–	–
21. Recirc. gas Temp (°F)	409	–	522	546	–
22. " " Press (iwg)	9.6	–	8.7	8.7	–
23. " " Flow (SCFH)	4000	–	5500	7200	–
24. Control Rm. O_2 (%)	N/A	N/A	N/A	N/A	N/A
25. Furnace Temp (°F)	2347	2293	2214	2258	2439
26. FGR O_2 (%)	4.6	–	7.75	7.75	–
27. FGR rate (%)	14.0	0	15.5	19.3	0
28.					
29.		BASELINE		MAX FGR	REPEAT
30.		@ 2% O_2			BASELINE

Test No. 4/4-15 4/4-22,23 Date 7-19-79 + 7-20-79 Location ________ Engr. Tidona

Unit No. ________ Fuel NG Capacity 2×10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

FGR @ 4% O_2

1. Test Number	4/4-15	4/4-16		4/4-22	4/4-23
2. Date	7-19-79	7-19-79		7-20-79	7-20-79
3. Time	16:00	16:30		13:05	13:25
4. Load	2.0×10^6	2.0×10^6		2.0×10^6	2.0×10^6
5. Process Rate					
6. Comb. Air Temp (°F)	118	176		115	117
7. " " Press (iwg)	1.6	4.3		2.8	2.2
8. " " Flow (SCFH)	22000	20000		22000	22500
9. Fuel Temp (°F)	70	70		70	70
10. " Press	1.3	1.5		1.2	1.2
11. " Flow (SCFH)	2000	2000		2000	2000
12. Steam Temp (°F)	—	—		—	—
13. " Press (psig)	—	—		—	—
14. " Flow (lb/h)	—	—		—	—
15. Water Temp (°F)	—	—		—	—
16. " Press (psig)	—	—		—	—
17. " Flow (gal/h)	—	—		—	—
18. Atomizing Air Temp (°F)	—	—		—	—
19. " " Press (psig)	—	—		—	—
20. " " Flow (SCFH)	—	—		—	—
21. Recirc. gas Temp (°F)	—	397		—	—
22. " " Press (iwg)	—	10.4		—	—
23. " " Flow (SCFH)	—	8500		—	—
24. Control Rm. O_2 (%)	N/A	N/A		N/A	N/A
25. Furnace Temp (°F)	2297	2253		2309	2310
26. FGR O_2 (%)	—	11.6		—	—
27. FGR rate (%)	0	16.6		0	0
28.					
29.	BASELINE	MAX FGR		CHECK BASE-	CHECK BASE-
30.				LINE @ 4% O_2	LINE @ 2% O_2

Data Sheet 6002-1

Test No. 4/4-17 to 21 Date JUL 20 1979 Location ________ Engr. Tidona

Unit No. ________ Fuel NG Capacity 2×10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

FGR at low O_2

1. Test Number	4/4-17	4/4-18	4/4-19	4/4-20	4/4-21
2. Date					
3. Time	10:40	11:20	11:45	12:15	12:45
4. Load	1.9×10^6	2.0×10^6	2.0×10^6	2.0×10^6	2.0×10^6
5. Process Rate					
6. Comb. Air Temp (°F)	110	142	167	218	116
7. " " Press (iwg)	1.9	2.6	3.0	3.5	2.0
8. " " Flow (SCFH)	20000	18500	20000	21000	20000
9. Fuel Temp (°F)	70	70	70	70	70
10. " Press	1.2	1.2	1.2	1.2	1.3
11. " Flow (SCFH)	1900	2000	2000	2050	2000
12. Steam Temp (°F)	–	–	–	–	–
13. " Press (psig)	–	–	–	–	–
14. " Flow (lb/h)	–	–	–	–	–
15. Water Temp (°F)	–	–	–	–	–
16. " Press (psig)	–	–	–	–	–
17. " Flow (gal/h)	–	–	–	–	–
18. Atomizing Air Temp (°F)	–	–	–	–	–
19. " " Press (psig)	–	–	–	–	–
20. " " Flow (scfh)	–	–	–	–	–
21. Recirc. gas Temp (°F)	–	310	387	493	–
22. " " Press (iwg)	–	12.0	11.5	9.2	–
23. " " Flow (SCFH)	–	4300	6000	8000	–
24. Control Rm. O_2 (%)	N/A	N/A	N/A	N/A	N/A
25. Furnace Temp (°F)	2300	2352	2365	2351	2461
26. FGR O_2 (%)	–	10.0	9.6	9.1	–
27. FGR rate (%)	0	10.1	12.9	17.1	0
28.					
29.	BASELINE			MAX FGR	REPEAT
30.					BASELINE

Data Sheet 6002-1

Test No. 4/5-1 to 4 **Date** JUL 23 1979 **Location** ______ **Engr.** Tidona

Unit No. ______ **Fuel** No.2 Oil **Capacity** 2×10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE **Burner Type** RADIAL/AXIAL

EXCESS O_2 VARIATIONS AT FULL CAPACITY

1. Test Number	4/5-1	4/5-2	4/5-3	4/5-4	
2. Date					
3. Time	14:30	14:55	15:10	15:40	
4. Load					
5. Process Rate					
6. Comb. Air Temp (°F)	114	116	116	116	
7. " " Press (iwg)	1.1	1.1	1.1	1.2	
8. " " Flow (SCFH)	22000	20400	19000	21000	
9. Fuel Temp (°F)	80	80	80	80	
10. " Press (psig)	56	57	58	57	
11. " Flow (~~SCFH~~ gph)	240 13.7	240 13.7	250 13.7	240 13.7	
12. Steam Temp (°F)	–	–	–	–	
13. " Press (psig)	–	–	–	–	
14. " Flow (lb/h)	–	–	–	–	
15. Water Temp (°F)	–	–	–	–	
16. " Press (psig)	–	–	–	–	
17. " Flow (gal/h)	–	–	–	–	
18. Atomizing Air Temp (°F)	80	80	80	80	
19. " " Press (psig)	76	775	78	77	
20. " " Flow (SCFH)	860	860	860	850	
21. Recirc. gas Temp (°F)	–	–	–	–	
22. " " Press (iwg)	–	–	–	–	
23. " " Flow (SCFH)	–	–	–	–	
24. Control Rm. O_2 (%)	N/A	N/A	N/A	N/A	
25. Furnace Temp (°F)	2294	2320	2285	2325	
26.					
27.	4% O_2	2% O_2	1.3% O_2	3% O_2	
28.		BASELINE			
29.					
30.					

Data Sheet 6002-1

Test No. 4/6-1 to 3 **Date** 7-23-79 **Location** ______ **Engr.** Tidona
Unit No. ______ **Fuel** No. 2 Oil **Capacity** 2 × 10⁶ Btu/h
Unit Type RESEARCH STEEL FURNACE **Burner Type** RADIAL/AXIAL

EXCESS O_2 VARIATIONS AT LOW LOAD

1. Test Number	4/6-1	4/6-2	4/6-3		
2. Date					
3. Time	16:20	16:30	16:55		
4. Load					
5. Process Rate					
6. Comb. Air Temp (°F)	113	114	113		
7. " " Press (iwg)	0.3	0.3	0.3		
8. " " Flow (SCFH)	11000	11000	11000		
9. Fuel Temp (°F)	80	80	80		
10. " Press (psig)	43	45.5	47.5		
11. " Flow (gph)	157 7.0	172 8.3	183 8.3		
12. Steam Temp (°F)	–	–	–		
13. " Press (psig)	–	–	–		
14. " Flow (lb/h)	–	–	–		
15. Water Temp (°F)	–	–	–		
16. " Press (psig)	–	–	–		
17. " Flow (gal/h)	–	–	–		
18. Atomizing Air Temp (°F)	80	80	80		
19. " " Press (psig)	75.5	76	77		
20. " " Flow (scfh)	880	880	880		
21. Recirc. gas Temp (°F)	–	–	–		
22. " " Press (iwg)	–	–	–		
23. " " Flow (scfh)	–	–	–		
24. Control Rm. O_2 (%)	N/A	N/A	N/A		
25. Furnace Temp (°F)	2107	2229	2106		
26.					
27.	4% O_2	2.1% O_2	0.3% O_2		
28.		BASELINE			
29.					
30.					

Data Sheet 6002-1

Test No. 4/6-4 to Date JUL 27 1979 Location ______ Engr. Tidona

Unit No. ______ Fuel NO, 2 Oil Capacity 2×10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

EXCESS O_2 VARIATIONS AT LOW LOAD

1. Test Number	4/6-4	4/6-5	4/6-6	9/8-19	
2. Date					
3. Time	3:00 P.M.	3:32	3:59	16:30	
4. Load (Btu/hr)	1×10^6	1×10^6	1×10^6	2×10^6	
5. Process Rate	1MM/HR	1MM/HR.	1MM/HR.	2MM/HR	
6. Comb. Air Temp (°F)	113°	111°	112°	113°	
7. " " Press (iwg)	.4	.3	.3	1.3	
8. " " Flow (SCFH)	11,600	10,200	9,500	18,200	
9. Fuel Temp (°F)	80°	80°	80°	80°	
10. " Press (psig)	37 PSI	37 PSI	37.5 PSI	51 PSI	
11. " Flow (gph)	7.4 GPH	7.4 GPH	7.4	2MM/24	
12. Steam Temp (°F)	—	—	—	—	
13. " Press (psig)	—	—	—	—	
14. " Flow (lb/h)	—	—	—	—	
15. Water Temp (°F)	—	—	—	—	
16. " Press (psig)	—	—	—	—	
17. " Flow (gal/h)	—	—	—	—	
18. Atomizing Air Temp (°F)	80°	80°	80°	80°	
19. " " Press (psig)	68 PSI	68 PSI	68	68 PSI	
20. " " Flow (SCFH)	860	850	850	850	
21. Recirc. gas Temp (°F)	—	—	—	—	
22. " " Press (iwg)	—	—	—	—	
23. " " Flow (SCFH)	—	—	—	—	
24. Control Rm. O_2 (%)	NA	NA	NA	NA	
25. Furnace Temp (°F)	2180°	2195°	2225	2280	
26.					
27.	4% O_2	2% O_2	Low O_2	Low O_2@2MM	
28.					
29.					
30.					

Data Sheet 6002-1

Test No. 4/7-1 to 4 **Date** JUL 24 1979 **Location** ______ **Engr.** Tidona

Unit No. ______ **Fuel** No. 2 Oil **Capacity** 2×10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE **Burner Type** AXIAL/RADIAL

STEAM INJECTION AT FULL LOAD

1. Test Number	4/7-1	4/7-2	4/7-3	4/7-4	4/7-4
2. Date					
3. Time	10:20	11:45	12:20	13:30	15:00
4. Load					
5. Process Rate					
6. Comb. Air Temp (°F)	108	109	108	109	109
7. " " Press (iwg)	0.5 *	0.8	0.6	0.6	0.6
8. " " Flow (SCFH)	19000	19500	19500	19500	19500
9. Fuel Temp (°F)	80	80	80	80	80
10. " Press (psig)	54	50	50	50	51
11. " Flow (~~SCFH~~ gph)	248 13.7	248 13.7	246 13.7	245 13.7	244 13.7
12. Steam Temp (°F)	–	277	268	272	261
13. " Press (psig)	–	57	60	60	58
14. " Flow (lb/h)	–	42.7	30.0	20.1	SP 20.0
15. Water Temp (°F)	–	–	–	–	–
16. " Press (psig)	–	–	–	–	–
17. " Flow (gal/h)	–	–	–	–	–
18. Atomizing Air Temp (°F)	80	80	80	80	80
19. " " Press (psig)	72	68	67	68	68
20. " " Flow (scfh)	850	800	800	800	800
21. Recirc. gas Temp (°F)	–	–	–	–	–
22. " " Press (iwg)	–	–	–	–	–
23. " " Flow (SCFH)	–	–	–	–	–
24. Control Rm. O_2 (%)	N/A	N/A	N/A	N/A	N/A
25. Furnace Temp (°F)	2300	2300	2265	?	2332
26.					
27.					
28.	BASELINE	40#/hr Stm	30#/hr Stm	20#/hr Stm	20#/hr Stm
29. *Comb. Air static press.		flame more		ran out of oil	
30. lower than yesterday		transparent - like NG flame		before getting furnace temp.	

Data Sheet 6002-1

Test No. 4/7-5 Date JUL 24 1979 Location ________ Engr. Tidona

Unit No. ________ Fuel No.2 Oil Capacity 2 x 10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

STM INJECTION AT FULL LOAD

1. Test Number	4/7-5	4/7-6			
2. Date					
3. Time	15:15	15:30			
4. Load					
5. Process Rate					
6. Comb. Air Temp (°F)	107	107			
7. " " Press (iwg)	0.6	0.6			
8. " " Flow (SCFH)	19500	19500			
9. Fuel Temp (°F)	80	80			
10. " Press (psig)	51	50			
11. " Flow (~~SCFH~~ gph)	242 13.7	247 13.7			
12. Steam Temp (°F)	273	—			
13. " Press (psig)	60	—			
14. " Flow (lb/h)	3.0 10.5	0			
15. Water Temp (°F)	—	—			
16. " Press (psig)	—	—			
17. " Flow (gal/h)	—	—			
18. Atomizing Air Temp (°F)	80	80			
19. " " Press (psig)	68	68			
20. " " Flow (scfh)	800	820			
21. Recirc. gas Temp (°F)	—	—			
22. " " Press (iwg)	—	—			
23. " " Flow (SCFH)	—	—			
24. Control Rm. O_2 (%)	N/A	N/A			
25. Furnace Temp (°F)	2335	2346			
26.					
27.					
28.	10#/hr Stm	REPEAT			
29.		BASELINE			
30.					

Data Sheet 6002-1

Test No. 4/8-1 to 5 Date JUL 25 1979 Location ______ Engr. Tidona

Unit No. ______ Fuel No. 2 Oil Capacity 2 × 10⁶ Btu/h

Unit Type RESEARCH STEEL FURNACE Burner Type ______

FGR @ 4% O_2

1. Test Number	4/8-1	4/8-2	4/8-3	4/8-4	4/8-5
2. Date					
3. Time	10:45	11:55	12:45	13:30	14:00
4. Load					
5. Process Rate					
6. Comb. Air Temp (°F)	106	143	122	160	178
7. " " Press (iwg)	2.5	4.2	3.6	4.0	5.6
8. " " Flow (SCFH)	23000	20000	22000	20000	19500
9. Fuel Temp (°F)	80	80	80	80	80
10. " Press (psig)	47	49	49	49	49
11. " Flow (gph)	243 13.0	249 13.7	249 13.7	249 13.7	249 13.7
12. Steam Temp (°F)	–	–	–	–	–
13. " Press (psig)	–	–	–	–	–
14. " Flow (lb/h)	–	–	–	–	–
15. Water Temp (°F)	–	–	–	–	–
16. " Press (psig)	–	–	–	–	–
17. " Flow (gal/h)	–	–	–	–	–
18. Atomizing Air Temp (°F)	80	80	80	80	80
19. " " Press (psig)	66	68	66	66	66
20. " " Flow (SCFH)	800	810	800	800	800
21. Recirc. gas Temp (°F)	–	409	309	403	475
22. " " Press (iwg)	–	10.5	11.1	10.7	9.7
23. " " Flow (SCFH)	–	3500	2200	6200	6400
24. Control Rm. O_2 (%)	N/A	N/A	N/A	N/A	N/A
25. Furnace Temp (°F)	2300	2361	2282	2292	2276
26. FGR O_2 (%)	–	10.5	10.5	9.5	9.6
27. FGR rate (%)	0	9.0	5.4	15.7	15.9
28.					
29.	0 FGR	9% FGR	5% FGR	15% FGR	max FGR
30.					

Data Sheet 6002-1

Test No. 4/8-6 to 10 Date JUL 25 1979 + 7-26-79 Location ________ Engr. Tidona

Unit No. ________ Fuel No. 2 Oil Capacity 2×10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

FGR @ 2% O_2

1. Test Number	4/8-6	4/8-7	4/8-8	4/8-9	4/8-10
2. Date				7-26-79	7-26-79
3. Time	14:35	15:10	16:00	11:10	11:45
4. Load					
5. Process Rate					
6. Comb. Air Temp (°F)	110	107	203	104	188
7. " " Press (iwg)	3.0	2.5	4.5	1.3	4.0
8. " " Flow (SCFH)	23000	21000	16250	19000	15000
9. Fuel Temp (°F)	80	80	80	80	80
10. " Press (psig)	43	48	48	49	49
11. " Flow (gph)	250 13.7	248 13.7	248 13.7	249 13.7	249 13.7
12. Steam Temp (°F)	–	–	–	–	–
13. " Press (psig)	–	–	–	–	–
14. " Flow (lb/h)	–	–	–	–	–
15. Water Temp (°F)	–	–	–	–	–
16. " Press (psig)	–	–	–	–	–
17. " Flow (gal/h)	–	–	–	–	–
18. Atomizing Air Temp (°F)	80	80	80	80	80
19. " " Press (psig)	56	64	67	68	68
20. " " Flow (scfh)	740	790	800	820	820
21. Recirc. gas Temp (°F)	–	–	510	–	406
22. " " Press (iwg)	–	–	9.0	–	9.8
23. " " Flow (SCFH)	–	–	7100	–	8800
24. Control Rm. O_2 (%)	N/A	N/A	N/A	N/A	N/A
25. Furnace Temp (°F)	2448	2322	2341	2335	2304
26. FGR O_2 (%)	–	–	9.4	–	9.5
27. FGR rate (%)	0	0	18.0	0	21.2
28.	REPEAT	BASELINE	max FGR	BASELINE	max FGR
29.	BASELINE	@ 2% O_2		2% O_2	
30.	@ 4% O_2			(lower comb air static press.)	

Data Sheet 6002-1

Test No. 4/8-11 to 15 Date JUL 26 1979 Location ______ Engr. Tidona

Unit No. ______ Fuel No. 2 Oil Capacity 2×10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

FGR @ 2% O_2 ⟶ | FGR @ low O_2 ⟶

1. Test Number	4/8-11	4/8-12	4/8-13	4/8-14	4/8-15
2. Date					
3. Time	12:10	12:35	13:50	14:15	14:50
4. Load					
5. Process Rate					
6. Comb. Air Temp (°F)	181	150	124	126	208
7. " " Press (iwg)	3.1	2.8	2.3	1.8	3.5
8. " " Flow (SCFH)	16000	17250	18500	17000	14500
9. Fuel Temp (°F)	80	80	80	80	80
10. " Press (psig)	49	50	44	49	51
11. " Flow (~~SCFH~~ gph)	249 13.7	249 13.7	250 13.7	249 13.7	251 13.7
12. Steam Temp (°F)	–	–	–	–	–
13. " Press (psig)	–	–	–	–	–
14. " Flow (lb/h)	–	–	–	–	–
15. Water Temp (°F)	–	–	–	–	–
16. " Press (psig)	–	–	–	–	–
17. " Flow (gal/h)	–	–	–	–	–
18. Atomizing Air Temp (°F)	80	80	80	80	80
19. " " Press (psig)	68	68	58	68	69
20. " " Flow (SCFH)	820	820	760	820	820
21. Recirc. gas Temp (°F)	451	390	271	267	444
22. " " Press (iwg)	9.8	11.0	12.7	12.9	9.4
23. " " Flow (SCFH)	6000	4000	2100	2600	8800
24. Control Rm. O_2 (%)	N/A	N/A	N/A	N/A	N/A
25. Furnace Temp (°F)	2380	2325	2315	2315	2336
26. FGR O_2 (%)	10.5	10.6	10.6	11.1	9.5
27. FGR rate (%)	14.7	10.2	5.3	6.1	19.8
28.					
29.	15% FGR	10% FGR	5% FGR	5% FGR	Max FGR
30.					

Data Sheet 6002-1

Test No. 4/8-16 to ~~18~~ 19 Date JUL 26 1979 + 7-27-79 Location ________ Engr. Tidona

Unit No. ________ Fuel No. 2 Oil Capacity 2×10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

FGR @ low O_2

1. Test Number	4/8-16	4/8-17	4/8-18	4/8-19	
2. Date				7-27-79	
3. Time	15:20	15:55	16:25	16:30	
4. Load					
5. Process Rate					
6. Comb. Air Temp (°F)	210	168	117	113	
7. " " Press (iwg)	3.0	2:3	1.2	1.3	
8. " " Flow (SCFH)	14500	15500	18000	18,200	
9. Fuel Temp (°F)	80	80	80	80	
10. " Press (Psig)	49.5	50	50	51	
11. " Flow (gph)	248 13.7	247 13.7	246 13.7	249 13.7	
12. Steam Temp (°F)	—	—	—	—	
13. " Press (psig)	—	—	—	—	
14. " Flow (lb/h)	—	—	—	—	
15. Water Temp (°F)	—	—	—	—	
16. " Press (psig)	—	—	—	—	
17. " Flow (gal/h)	—	—	—	—	
18. Atomizing Air Temp (°F)	80	80	80	80	
19. " " Press (psig)	68.5	69	69	68	
20. " " Flow (SCFH)	820	820	830	850	
21. Recirc. gas Temp (°F)	492	407	—	—	
22. " " Press (iwg)	3.0	10.7	—	—	
23. " " Flow (SCFH)	6600	4000	—	—	
24. Control Rm. O_2 (%)	N/A	N/A	N/A	N/A	
25. Furnace Temp (°F)	2365	2318	2360	2280	
26. FGR O_2 (%)	9.6	10.5	—	—	
27. FGR rate (%)	16.8	10.0	0	—	
28.					
29.	15% FGR	10% FGR	BASELINE	LOW O_2	
30.					

Data Sheet 6002-1

Test No. 4/9-1 to 3 4/10-1 to 2 Date 7-31 Location ______ Engr. Tidona 4/10-1 to 2

Unit No. ______ Fuel NG Capacity 2×10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

FLAME PROFILE - FULL CAP. → FLAME PROFILE - LOW LOAD.

1. Test Number	4/9-1	4/9-2	4/9-3	4/10-1	4/10-2
2. Date	7-31-79	→	→	→	→
3. Time	10:00	10:25	11:05	11:55	12:40
4. Load (Btu/h)	2.0×10^6	→	→	1.0×10^6	→
5. Process Rate					
A4 6. Comb. Air Temp (°F)	706	107	109	108	108
7. " " Press (iwg)	2.8	2.6	2.2	0.6	0.5
8. " " Flow (SCFH)	23000	21500	20500	11500	10500
9. Fuel Temp (°F)	80	80	80	80	80
10. " Press (iwg)	1.2	1.2	1.2	0.3	0.3
11. " Flow (SCFH)	2000	2000	2000	960	1000
12. Steam Temp (°F)					
13. " Press (psig)					
14. " Flow (lb/h)					
15. Water Temp (°F)					
16. " Press (psig)					
17. " Flow (gal/h)					
18. Atomizing Air Temp (°F)					
19. " " Press (psig)					
20. " " Flow (SCFH)					
21. Recirc. gas Temp (°F)					
22. " " Press (iwg)					
23. " " Flow (SCFH)					
24. Control Rm. O_2 (%)	N/A	N/A	N/A	N/A	N/D
25. Furnace Temp (°F)	2343	2278	2303	2239	2303
26.					
27.					
28. Nominal O_2	4% O_2	2% O_2	LOW O_2	4% O_2	2% O_2
29.					
30.					

Data Sheet 6002-1

Test No. 4/10-3 Date 1111. 9 1 1979 Location ________ Engr. Tidona

Unit No. ________ Fuel NG Capacity 2×10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

FLAME PROFILE TESTS: LOW LOAD → | FULL CAP. - WATER INJECTION → | ← BASELINE →

1. Test Number	4/10-3	4/11-1	4/11-2	4/11-3	
2. Date					
3. Time	13:10	14:35	15:05	16:50	
4. Load (Btu/hr)	1.0×10^6	2.0×10^6	2.0×10^6	2.0×10^6	
5. Process Rate					
6. Comb. Air Temp (°F)	109	115	116		
7. " " Press (iwg)	0.4	2.3	2.3	2.4	
8. " " Flow (SCFH)	9600	21500	21000	21000	
9. Fuel Temp (°F)	80	80	80	80	
10. " Press (iwg)	0.3	1.2	1.2	1.2	
11. " Flow (SCFH)	980	2000	2000	2000	
12. Steam Temp (°F)		—	—	—	
13. " Press (psig)		—	—	—	
14. " Flow (lb/h)		—	—	—	
15. Water Temp (°F)		70	70	—	
16. " Press (psig)		—	—	—	
17. " Flow (gal/h)		2.4	4.8	0	
18. Atomizing Air Temp (°F)					
19. " " Press (psig)					
20. " " Flow (SCFH)					
21. Recirc. gas Temp (°F)					
22. " " Press (iwg)					
23. " " Flow (SCFH)					
24. Control Rm. O_2 (%)	N/A	N/A	N/A	N/A	
25. Furnace Temp (°F)	2294	2260	2250	2220	
26.					
27.	LOW O_2	2% O_2	2% O_2	2% O_2	
28.		2.4 gph	4.8 gph	No H_2O	
29.					
30.					

Data Sheet 6002-1

Test No. 4/12-1 Date AUG 1 1979 Location ______ Engr. Tidona

Unit No. ______ Fuel NG Capacity 2 x 10⁶ Btu/h

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

15% FGR @ 2% O_2 – FLAME PROFILE TEST

1. Test Number	4/12-1	4/12-2			
2. Date					
3. Time	09:25	10:30			
4. Load (Btu/hr)	2.0×10^6	2.0×10^6			
5. Process Rate					
6. Comb. Air Temp (°F)	102	158			
7. " " Press (iwg)	2.4	3.8			
8. " " Flow (SCFH)	21500	19000			
9. Fuel Temp (°F)	80	80			
10. " Press (iwg)	1.2	1.1			
11. " Flow (SCFH)	2000	2000			
12. Steam Temp (°F)		–			
13. " Press (psig)		–			
14. " Flow (lb/h)		–			
15. Water Temp (°F)		–			
16. " Press (psig)		–			
17. " Flow (gal/h)		–			
18. Atomizing Air Temp (°F)		–			
19. " " Press (psig)		–			
20. " " Flow (SCFH)		–			
21. Recirc. gas Temp (°F)	–	382			
22. " " Press (iwg)	–	+10.2			
23. " " Flow (SCFH)	0	5500			
24. Control Rm. O_2 (%)	N/A	N/A			
25. Furnace Temp (°F)	2278	2259			
26. FGR O_2 (%)	–	10.4			
27. FGR rate (%)	–	12.6			
28.					
29.	BASELINE	~15% FGR			
30.					

Data Sheet 6002-1

Test No. 4/13-1 to 3 **Date** AUG 1 1979 **Location** **Engr.** Tidona

Unit No. **Fuel** No.2 Oil **Capacity** 2 × 10⁶ Btu/h

Unit Type RESEARCH STEEL FURNACE **Burner Type** RADIAL/AXIAL

EXCESS O_2 VARIATIONS - LOW LOAD - FLAME PROFILE TESTS

1. Test Number	4/13-1	4/13-2	4/13-3		
2. Date					
3. Time	11:45	12:37	13:05		
4. Load					
5. Process Rate					
6. Comb. Air Temp (°F)	107	107	106		
7. " " Press (iwg)	0.4	.3	0.2		
8. " " Flow (SCFH)	11000	9,700	9000		
9. Fuel Temp (°F)	80	80°	80		
10. " Press (Psig)	32.5	32.5	32		
11. " Flow (~~SCFH~~ gph)	166 7.4	7.4 GPH 166	165 7.4		
12. Steam Temp (°F)	-	-			
13. " Press (psig)	-	-			
14. " Flow (lb/h)	-	-			
15. Water Temp (°F)	-	-			
16. " Press (psig)	-	-			
17. " Flow (gal/h)	-	-			
18. Atomizing Air Temp (°F)	80	80	80		
19. " " Press (psig)	63	62 psi	60		
20. " " Flow (SCFH)	820	820	820		
21. Recirc. gas Temp (°F)	-	-			
22. " " Press (iwg)	-	-			
23. " " Flow (SCFH)	-	-			
24. Control Rm. O_2 (%)	N/A	N/A	N/A		
25. Furnace Temp (°F)	2286	2270	2297		
26.					
27.	4% O_2	2% O_2	Low O_2		
28.					
29.					
30.					

Data Sheet 6002-1

Test No. 4/14-1 to 3 Date AUG 1 1979 Location ________ Engr. Tidona

Unit No. ________ Fuel No. 2 Oil Capacity 2×10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

FULL CAP.

FLAME PROFILE TESTS— EXCESS O_2 VARIATIONS

1. Test Number	4/14-1	4/14-2	4/14-3		
2. Date					
3. Time	14:25	14:45	15:15		
4. Load					
5. Process Rate					
6. Comb. Air Temp (°F)	106	107	105		
7. " " Press (iwg)	2.0	1.7	1.7		
8. " " Flow (SCFH)	21500	19500	18500		
9. Fuel Temp (°F)	80	80	80		
10. " Press (psig)	47	50	49		
11. " Flow (gph)	[illegible] 13.7	[illegible] 13.7	[illegible] 13.7		
12. Steam Temp (°F)					
13. " Press (psig)					
14. " Flow (lb/h)					
15. Water Temp (°F)					
16. " Press (psig)					
17. " Flow (gal/h)					
18. Atomizing Air Temp (°F)	80	80	80		
19. " " Press (psig)	64	69	68		
20. " " Flow (scfh)	810	840	810		
21. Recirc. gas Temp (°F)					
22. " " Press (iwg)					
23. " " Flow (SCFH)					
24. Control Rm. O_2 (%)	N/A	N/A	N/A		
25. Furnace Temp (°F)	2272	2288	2263		
26.					
27.					
28.	4% O_2	2% O_2	1.3% O_2		
29.					
30.					

Data Sheet 6002-1

Test No. 4/15-1 to 2 **Date** AUG 02 1979 **Location** ______ **Engr.** Tidona

Unit No. ______ **Fuel** No. 2 Oil **Capacity** 2 × 10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE **Burner Type** RADIAL/AXIAL

40 #/hr Steam Injection – Flame Profile Test

1. Test Number	4/15-1	4/15-2			
2. Date	8-2-79				
3. Time	13:40	14:25			
4. Load					
5. Process Rate					
6. Comb. Air Temp (°F)	114°	112°			
7. " " Press (iwg)	1.8	1.8			
8. " " Flow (SCFH)	20,000	20,000			
9. Fuel Temp (°F)	80°	85°			
10. " Press (psig)	43	43			
11. " Flow (gph)	13.7	13.7			
12. Steam Temp (°F)	—	270			
13. " Press (psig)	—	62			
14. " Flow (lb/h)	—	40			
15. Water Temp (°F)	—	—			
16. " Press (psig)	—	—			
17. " Flow (gal/h)	—	—			
18. Atomizing Air Temp (°F)		80			
19. " " Press (psig)	58	58			
20. " " Flow (SCFH)	760	760			
21. Recirc. gas Temp (°F)	—	—			
22. " " Press (iwg)	—	—			
23. " " Flow (SCFH)	—	—			
24. Control Rm. O_2 (%)	N/A	N/A			
25. Furnace Temp (°F)	2342	2285°			
26.					
27.	2% O_2	40#/hr stm			
28.	BASELINE				
29.					
30.					

Data Sheet 6002-1

Test No. 4/16-1 Date AUG 8 1979 Location ________ Engr. Tidona

Unit No. ________ Fuel No. 2 Oil Capacity 2×10^6 Btu/h

Unit Type RESEARCH STEEL FURNACE Burner Type RADIAL/AXIAL

2% O_2, 15% FGR – FLAME PROFILE TEST

1. Test Number	4/16-1	4/16-2			
2. Date					
3. Time	09:35	12:15			
4. Load					
5. Process Rate					
6. Comb. Air Temp (°F)	97	179			
7. " " Press (iwg)	1.4	2.9			
8. " " Flow (SCFH)	19000	16100			
9. Fuel Temp (°F)	75	75			
10. " Press (psig)	46	45			
11. " Flow (gph)	248 13.7	246 137			
12. Steam Temp (°F)					
13. " Press (psig)					
14. " Flow (lb/h)					
15. Water Temp (°F)					
16. " Press (psig)					
17. " Flow (gal/h)					
18. Atomizing Air Temp (°F)	75	75			
19. " " Press (psig)	65	64			
20. " " Flow (scfh)	800	800			
21. Recirc. gas Temp (°F)	–	427			
22. " " Press (iwg)	–	10.0			
23. " " Flow (SCFH)	0	5750			
24. Control Rm. O_2 (%)	N/A	N/A			
25. Furnace Temp (°F)	2300	2268			
26. FGR O_2 (%)	–	11.5			
27. FGR rate (%)	0	12.9			
28.					
29.	BASELINE	15% FGR			
30.		(GOKSOYR-ROSS TEST FOR SO_x)			

Data Sheet 6002-1

FUEL ANALYSES, LOCATION 4

GAS COMPOSITION

1979 March Figures
Pan Handle Gas

		Percent
1.	CH_4	90.402
2.	Ethane	3.343
3.	Propane	.487
4.	Isobutane	.067
5.	N. Butane	.095
6.	N. Propane	.001
7.	Isopentane	.021
8.	N. Pentane	.018
9.	Hexanes	.021
10.	Heptanes	.014
11.	Octanes	.009
12.	NO + Hydrogen	----
13.	N_2	5.024
14.	O_2	----
15.	CO	----
16.	Argon	.026

		Percent
1.	Hydrogen Sulfide	.058
2.	Mercapins	.149
3.	Monosulfides	.021
4.	Disulfides	.020
	TOTAL	.248

S. G. of Gas		.6045
Heating Value	Sat.	979 Btu
Btu/ft^3 dry		998.1
Btu/ft^3 Sat. (Calculated)		980.7

#2 Oil, 1979 Test 4/5-1 and Test 4/14-1

Sample Identification:
1. EPA 6014, July 23, 1979 Test 4/5-1, No. 2 Oil
2. EPA 6014, August 1, 1979 Test 4/14-1, No. 2 Oil

	1	2
Carbon, %	87.08	86.80
Hydrogen, %	12.29	12.78
Sulfur, %	0.47	0.36
Nitrogen, %	0.02	0.02
Ash, %	<0.001	<0.001
Oxygen (by diff.), %	0.14	0.04
Heat of combustion		
Gross, BTU/lb	19270	19370
Net, BTU/lb	18150	18200
API gravity @ 60°F	33.2	34.9

KVB

SO$_x$ DATA SHEET (GOKSOYR-ROSS METHOD)

Test No. 4/16-2 Date AUG 2 1979 Location

Unit No. Fuel No.2 Oil

Capacity 2×10^6 Btu/hr Unit Type RESEARCH STEEL FURNACE

Engr. Tilma Conditions 2% O_2, 15% FGR

Sampling in FGR duct downstream of recirc. fan.

Meter Finish 498.490

Meter Start 495.425

Sample Volume Collected = 3.065 ADCF

Start Time	Stop Time	Elapsed Time (minutes)
12:06	12:47	41

Total Sampling Time = 41 min.

Time	Meter Vac. ("Hg)	Temperatures (°F)					Sample Flow Rate (ADCFM)	O_2 in FGR duct
		Meter	Coil In	Coil Out	Water Bath	Stack		
12:07	0.0	92	119	131	165	429		11.5%
12:13	0.0	92	109	132	166	427		11.5%
12:18	0.0	93	113	133	170	427	.075	11.5%
12:22	0.0	93	115	136	173	427	.075	11.5%
12:28	0.0	93	147	142	177	426	.075	11.5%
12:36	0.0	93	163	145	180	424	.075	11.5%
12:45	0.0	93	169	147	181	424	.075	11.1%
AVG	0.0	93						

NOTES: (1) Sample flow rate at meter should be 0.075 ADCFM or 0.01 cf/8 secs.

(2) Total sample volume collected should be ~1.5 cf (~ 20 minutes sampling time).

Note: At 12:25, insulated the glass probe – also improved T/c fit in G.R. coil T/c wells.

Data Sheet KVB 6015-37

Date 8-2-79

K V B. INC.

Test No. 4116-2

SOx DATA SHEET

TEST NO.____ UNIT NO.____ FUEL No. 2 Oil LOAD 1.8x10^6 Btu/hr ~~klb/hr~~ ____ Location____

Box No.					
Time					
Temp. in Gas Meter					
Press. in Gas Meter					
Meter Reading					
Barom. Press.					
Percent Oxygen					
N_2 Purge Time					

Calculation: SO_3 or SO_2, ppm = $\frac{(A - B) \times N \times F \times (460 + T) \times 24}{V (P + p)}$

Excess O_2 11.5 %

	SO_2	SO_3	SO_x
A = Ml of ~~lead perchlorate~~ NaOH used for sample =	4.5	0.0	
B = Ml of ~~lead perchlorate~~ NaOH used for blank =	0.0	0.0	
N = Normality of ~~lead perchlorate~~ NaOH titrant =	0.023	0.023	
F = Dilution factor =	10	none	
T = Average temp. in gas meter (°F) =	93	93	
V = Volume of gas sample (ft3) - uncorrected =	3.065	3.065	
P = Barometric pressure (in Hg) =	29.88	29.88	
p = Pressure in gas meter (in Hg gage) =	0.0	0.0	
=	150 ppm @ 11.5% O_2, wet	(185	ppm, dry @ 11.5%
Concentration, C, ppm (dry @ 3% O_2) =	351	0.0	351
, gm/dscm =		0.0	
Emission, E, g/Mcal =			
lb/MBtu =			
ng/J =			

$E = CF\left[\frac{2090}{20.9 - xO_2}\right]$

where

C = pollutant concentration, g/dscm

F, volume factor = ________ dscm/10^4 cal

________ dscf/10^4 Btu

from Fed. Reg. 9/11/74 p 32856

60-14
rev. 1/2/75

LOCATION 5 - HOGGED FUEL BOILER

HOGGED FUEL POWER BOILER

Location No. 5 **Unit No.** 10

Unit Description HOGGED FUEL POWER BOILER

- SPREADER - STOKER WITH FOUR OIL GUNS IN CORNERS FIRING TANGENTIALLY ABOVE BED

Installation Date SEPTEMBER, 1977

Heater Rating 58.6 MW (200,000 lb steam/h) wood only; 73.3 MW (250,000 lb/h) wood + oil

Burner Description SPREADER - STOKER WITH FOUR OIL GUNS ABOVE BED

Test Fuel Combinations HOGGED FUEL ONLY

HOGGED FUEL PLUS NO. 6 OIL

Fuel Temp. at Burner (°F) SLIGHTLY LESS THAN UNDERGRATE AIR TEMP.

Primary Air Temp. (°F) UNDERGRATE AIR TEMP. = 533K (500°F)

Comments:

MOBILE LABORATORY DATA

Test No. 5-1-1

Test No. 5-1-1 Date 9-17 79 Location 5 Engr. TIDONE

Unit No. 10 Fuel HOGGED Capacity 2.0 X 10 5

Unit Type HOGGED FUEL PWR. BLR. Burner Type SPREADER - STOKER

1. Test No.	5/1-1		5/1-1		5/1-1		5/1-1		5/1-1	
2. Date	9/17/79									
3. Time	16:35		17:50		1835		2000		2038	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft	20' x 5' 8.5"		→							
7. Probe Position	4' IN		→							
8. Oxygen (%)	6.8		8.75		8.4		7.8		9.65	
9. NOx (hot) read/3% O_2 (ppm)*	62	91	62	106	60	100	71	113	58	107
10. NO (hot) read/3% O_2 (ppm)*	61	90	60	103	55	91	68	108	51	94
11. NO_2 (hot) read/3% O_2 (ppm)*	1	1	2	3	5	9	3	5	7	13
12. NO (cold) read/3% O_2 (ppm)*	—				64	91				
13. Carbon Dioxide (%)	12.8%		12.0%		12.8		15.0		10.9	
14. Carbon Monoxide (ppm) uncor/cor*	520	659	750	1102	910	1300	480	655	2000+	3172+
15. Hydrocarbon (ppm) uncor/cor*	39	58	51	87	54	90	54	86	45	83
16. Sulfur Dioxide (ppm) uncor/cor*	40	59	20	34	25	42	15	24	34	63
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C) F°	79		79°		79°		77°		77°	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.72		30.72		30.72		30.67		30.67	
21. Relative Humidity (%)										
22.	CO_2 @									
23.	17:00									
24.										
25.									CO very	
26.									high	
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 5/2-1A 5/2-4

Test No. 5/2-1A +5/2-4 Date 9/21/79 Location 5 Engr. TIDONA

Unit No. 10 Fuel Hogged Capacity 200,000 lb stm/hr

Unit Type Hogged Fuel Power Boiler Burner Type Spreader - Stoker

1. Test No.	5/2-1A		5/2-4				
2. Date	9/21/79		9/21/79				
3. Time	1540		1615				
4. Load							
5. Process Rate							
6. Flue Diam. or Size, ft							
7. Probe Position							
8. Oxygen (%)	7.0		5.7				
9. NOx (hot) read/3% O_2 (ppm)*	52	78	47	69			
10. NO (hot) read/3% O_2 (ppm)*	47		44				
11. NO_2 (hot) read/3% O_2 (ppm)*	5	7	3	4			
12. NO (cold) read/3% O_2 (ppm)*	55	71	55	65			
13. Carbon Dioxide (%)	12.0		12.9				
14. Carbon Monoxide (ppm) uncor/cor*	1060	1363	720	847			
15. Hydrocarbon (ppm) uncor/cor*	30	45	65	96			
16. Sulfur Dioxide (ppm) uncor/cor*	4	6	2	3			
17. Smoke Spot (Bacharach)							
18. Atmos. Temp. (°F/°C)	85		85				
19. Dew Point Temp. (°F/°C)							
20. Atmos. Pressure (in. Hg)	30.60		30.63				
21. Relative Humidity (%)							
22.							
23.							
24.	REPEAT		LOWEST O_2				
25.	BASELINE						
26.							
27.							
28.							
29.							
30.							

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 5/9-1 / 5/2-1A to 3

Test No. 5/9-1 & 2 Date 9-21-79 Location 5 Engr. T DONA

Unit No. 5/2-1A to 3 10 Fuel Hogged Capacity 200,000 lbs steam/h.

Unit Type Hogged Fuel Power Boiler Burner Type Spreader - Stoker

1. Test No.	5/9-1		5/9-1		5/2-1A		5/2-2		5/2-3-	
2. Date	9/21/79		9/21/79		9/21/79		9/21,79		9/21/79	
3. Time	1200		1250		1350		1430		1505	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position										
8. Oxygen (%)	7.6		7.9		7.45		6.5		9.3	
9. NOx (hot) read/3% O_2 (ppm)*	70	126	64	98	49	81	55	106	41	88
10. NO (hot) read/3% O_2 (ppm)*	68		61		46		52		38	
11. NO_2 (hot) read/3% O_2 (ppm)*	2	4	3	5	3	5	3	5	3	6
12. NO (cold) read/3% O_2 (ppm)*	91	122	68	93	57	76	81	101	53	82
13. Carbon Dioxide (%)	11.4		11.3		12.0		13.6		10.2	
14. Carbon Monoxide (ppm) uncor/cor*	460	475	740	1017	1265	1680	720	894	2080+	3077+
15. Hydrocarbon (ppm) uncor/cor*	34	61	48	74	30	49	18	35	95	204
16. Sulfur Dioxide (ppm) uncor/cor*	49	88	38	58	12	20	0	0	0	0
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	79		78		77		80		83	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.63		30.63		30.63		30.60		30.59	
21. Relative Humidity (%)										
22.										
23.										
24.					BASELINE		LOW O_2		HIGH O_2	
25.										
26.										
27.							Conditions			
28.							changed			
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA **Test No.** 5/2-1B

Test No. 5-2-1B **Date** 9/20/79 **Location** 5 **Engr.** TIDONA

Unit No. 10 **Fuel** Hogged **Capacity** 2.0 x 10^5

Unit Type Hogged Fuel Tower B4 **Burner Type** Spreader - Stoker

BASELINE BRINK → PARTICULATES

1. Test No.	5-2-1B		5-2-1B		5-2-1B		5-2-1B		5-2-1B	
2. Date	9/20/79		9/20/79		9/20/79		9/20/79		9/20/79	
3. Time	1415		1445		1515		1545		1615	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft	20'x5'2.5'		→							
7. Probe Position	41 in		→							
8. Oxygen (%)	10.0		10.1		10.1		10.0		7.8	
9. NOx (hot) read/3% O_2 (ppm)*	37	86	38	82	38	95	40	88	40	74
10. NO (hot) read/3% O_2 (ppm)*	33		33		31		35		37	
11. NO_2 (hot) read/3% O_2 (ppm)*	4	9	5	11	7		5	11	3	6
12. NO (cold) read/3% O_2 (ppm)*	47	77	43	71	47	78	47	77	50	68
13. Carbon Dioxide (%)	10.3		9.2		8.0		8.6		12.0	
14. Carbon Monoxide (ppm) uncor/cor*	2000+	3273+	2000+	3303+	2000+	3303+	2000+	3273+	2000+	2727+
15. Hydrocarbon (ppm) uncor/cor*	150	350	105	226	285	714	95	209	30	55
16. Sulfur Dioxide (ppm) uncor/cor*	30	70	30	65	17	43	21	46	12	22
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	79		77		79		78		78	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.63		30.63		30.61		30.60		30.60	
21. Relative Humidity (%)										
22.										
23.										
24.					add control rm O_2 values					
25. ~ 160,000 sdm flow → #					to these for avg. O_2					
26.					level for test					
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA **Test No.** 5/2-18

Test No. 5/2-18 **Date** 9/20/79 **Location** 5 **Engr.** TIDONA

Unit No. 10 **Fuel** Hogged **Capacity** 2.0×10^5

Unit Type Hogged Fuel Power Pl. **Burner Type** Spreader – Stoker

1. Test No.	5/2-18		5/2-18		5/2-18		5/2-18		5/2-18	
2. Date	9/20/79		9/20/79		9/20/79		9/20/79		9/20/79	
3. Time	1645		1715							
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft	20'×5'2.5"		→							
7. Probe Position	4' in		→							
8. Oxygen (%)	8.1		9.3							
9. NOx (hot) read/3% O_2 (ppm)*	44	70	42	78						
10. NO (hot) read/3% O_2 (ppm)*	42		39							
11. NO_2 (hot) read/3% O_2 (ppm)*	2	3	3	6						
12. NO (cold) read/3% O_2 (ppm)*	48	67	47	72						
13. Carbon Dioxide (%)	11.3		10.2							
14. Carbon Monoxide (ppm) uncor/cor*	1470	2051	1380	1926						
15. Hydrocarbon (ppm) uncor/cor*	30	48	22	41						
16. Sulfur Dioxide (ppm) uncor/cor*	12	19	10	19						
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	78		78							
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.61		30.62							
21. Relative Humidity (%)										
22.										
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA **Test No.** 5/2-1c

Test No. 5/2-1C **Date** 9/24/79 **Location** 5 **Engr.** TIDONA

Unit No. 10 **Fuel** Hogged **Capacity**

Unit Type Hogged Fuel Power Blr. **Burner Type** SPREADER-STOKER

	BLR. OUT HOT		D.C. OUT. COLD		BLR.OUT. HOT		D.C. OUT COLD		BLR. OUT HOT	
1. Test No.	5/2-1C		5/2-1C		5/2-1C		5/2-1C		5/2-1C	
2. Date	9/24/79		9/24/79		9/24/79		9/24/79		9/24/79	
3. Time	1435		1425		1450		1505		1550	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position			ports 2&6				ports 2&6			
8. Oxygen (%)	9.0		9.2		9.5		11.0		9.8	
9. NOx (hot) read/3% O_2 (ppm)*	37	79			35	91			35	
10. NO (hot) read/3% O_2 (ppm)*	31				27				25	
11. NO_2 (hot) read/3% O_2 (ppm)*	6	13			8				10	
12. NO (cold) read/3% O_2 (ppm)*	44	66	48	73	45	70	55	99	27	43
13. Carbon Dioxide (%)	9.6		9.2		9.9		9.6		7.8	
14. Carbon Monoxide (ppm) uncor/cor*	2000+	>3000	2000+	>3051	2000+	>3130	2000+	>3600	2000+	>3214
15. Hydrocarbon (ppm) uncor/cor*	310	660			300	783			500+	
16. Sulfur Dioxide (ppm) uncor/cor*	—				20	52			30	
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)			67						72	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)			30.68						30.66	
21. Relative Humidity (%)										
22.										
23.					WOOD + OIL (#6)				incorrect	
24.					being fired				dry NO rdg	
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 5/2-1C

Test No. 5/2-1C Date 9/24/79 Location 5 Engr. TIDONA

Unit No. 10 Fuel Hogged Capacity

Unit Type Hogged Fuel Power Boiler Burner Type Spreader - Stoker

	D.C. OUT COLD		BLR. OUT HOT		D.C. OUT COLD		BLR. OUT HOT		BLR. OUT HOT	
1. Test No.	5/2-1C		5/2-1C		5/2-1C		5/2-1C		5/2-1C	
2. Date	9/24/79		9/24/79		9/24/79		9/24/79		9/24/79	
3. Time	1535		1615		1640		1735		1800	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position	port 2&6				port 2&6					
8. Oxygen (%)	8.9		9.0		8.9		9.5		9.5	
9. NOx (hot) read/3% O_2 (ppm)*			42	95			36	82	38	90
10. NO (hot) read/3% O_2 (ppm)*			30				31		33	
11. NO_2 (hot) read/3% O_2 (ppm)*			12	27			5	12	5	12
12. NO (cold) read/3% O_2 (ppm)*	57	85	45	68	55	82	45	70	50	78
13. Carbon Dioxide (%)	9.3		9.2		10.0		8.6		8.6	
14. Carbon Monoxide (ppm) uncor/cor*	2000+	>2975	2000+	>3000	2000+	>2975	2000+	>3130	2000+	>3130
15. Hydrocarbon (ppm) uncor/cor*			500+	>1125			70	159	190	451
16. Sulfur Dioxide (ppm) uncor/cor*			32	72			0	0	0	0
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	69		71		71		69		69	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.67		30.66		30.66		30.64		30.63	
21. Relative Humidity (%)										
22.										
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA **Test No.** 5/2-1C

Test No. 5/2-1C **Date** 9/24/79 **Location** #5 **Engr.** TIDONA

Unit No. 10 **Fuel** Hogged **Capacity** 200,000 lbs/sq.ft.

Unit Type Hogged Fuel Power Boiler **Burner Type** Spreader - Stoker

BLR. OUT HOT →

1. Test No.	5/2-1C		5/2-1C		5/2-1C					
2. Date	9/24/79		9/24/79		9/24/79					
3. Time	1840		1910		1940					
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position										
8. Oxygen (%)	10.0		10.0		9.4					
9. NOx (hot) read/3% O_2 (ppm)*	32	84	35	84	31	79				
10. NO (hot) read/3% O_2 (ppm)*	28		32		28					
11. NO_2 (hot) read/3% O_2 (ppm)*	4	10	3	7	3	8				
12. NO (cold) read/3% O_2 (ppm)*	45	74	47	77	46	71				
13. Carbon Dioxide (%)	8.6		8.9		10.0					
14. Carbon Monoxide (ppm) uncor/cor*	2000+	>3273	>2000	>3273	—	—				
15. Hydrocarbon (ppm) uncor/cor*	270	710	140	336	90	229				
16. Sulfur Dioxide (ppm) uncor/cor*	5	13	1	2	0	0				
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	65		64		62					
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.62		30.61		30.61					
21. Relative Humidity (%)										
22.										
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA Test No. 5/2-1d

Test No. 5/2-1d Date 9-25-79 Location 5 Engr. TIDONA

Unit No. 10 Fuel HOGGED Capacity 2 x 10⁵ lb STM/HR

Unit Type HOGGED FUEL PWR. BLR. Burner Type SPREADER STOKER

	← BRINK					→	G/R Sax		G/R Sax	
1. Test No.	5/2-1d								→	
2. Date	9-25-79								→	
3. Time	1230		1300		1330		1600		1630	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft	5'x20'5½								→	
7. Probe Position	4' IN								→	
8. Oxygen (%)	5.9		7.2		7.3		9.5		7.7	
9. NOx (hot) read/3% O_2 (ppm)*	27	39	31	46	41	58	32	67	30	48
10. NO (hot) read/3% O_2 (ppm)*	25		30		39		30		28	
11. NO_2 (hot) read/3% O_2 (ppm)*	2	3	1	1	2	3	2	4	2	3
12. NO (cold) read/3% O_2 (ppm)*	30	36	34	45	42	55	40	63	33	45
13. Carbon Dioxide (%)	13.8		12.0		12.0		10.0		10.6	
14. Carbon Monoxide (ppm) uncor/cor*	2000	2384	2000	2609	2000	2628	2000	3130	2000	2707
15. Hydrocarbon (ppm) uncor/cor*	70	100	45	67	70	99	40	83	65	104
16. Sulfur Dioxide (ppm) uncor/cor*	25	36	25	37	15	21	18	38	75	120
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	72		72		72		71		70	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.61		30.61		30.61		30.60		30.60	
21. Relative Humidity (%)										
22.										
23.										
24.										
25.	BASELINE					→	BASELINE			→
26.	SOME		NO. 6 OIL			→	ALL WOOD			→
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA **Test No.** 5-2-1d

Test No. 5-2-1d **Date** 9/25/79 **Location** #5 **Engr.** Tidona

Unit No. 10 **Fuel** Hogged **Capacity**

Unit Type **Burner Type**

1. Test No.	5-2-1d		5-2-1d				
2. Date	9/25		9/25				
3. Time	1700		1730				
4. Load							
5. Process Rate							
6. Flue Diam. or Size, ft	5'x20'x5'		—				
7. Probe Position	4' in		—				
8. Oxygen (%)	5.9		5.0				
9. NOx (hot) read/3% O_2 (ppm)*	33	46	36	47			
10. NO (hot) read/3% O_2 (ppm)*	31		35				
11. NO_2 (hot) read/3% O_2 (ppm)*	2	3	1	1			
12. NO (cold) read/3% O_2 (ppm)*	36	43	41	46			
13. Carbon Dioxide (%)	14		14.4				
14. Carbon Monoxide (ppm) uncor/cor*	2000	2384	2000	2250			
15. Hydrocarbon (ppm) uncor/cor*	N/A		N/A				
16. Sulfur Dioxide (ppm) uncor/cor*	22	30	10	13			
17. Smoke Spot (Bacharach)							
18. Atmos. Temp. (°F/°C)	70		70				
19. Dew Point Temp. (°F/°C)							
20. Atmos. Pressure (in. Hg)	30.60		30.60				
21. Relative Humidity (%)							
22.							
23.							
24.	BASELINE →						
25.	ALL WOOD →						
26.							
27.							
28.							
29.							
30.							

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA **Test No.** 5-2-1e

Test No. 5-2-1e **Date** 9/26/79 **Location** #5 **Engr.** Tidona

Unit No. 10 **Fuel** Hogged **Capacity**

Unit Type **Burner Type**

1. Test No.	5-2-1e		→		→				→	
2. Date	9/26		→		→		→		→	
3. Time	1600		1630		1635		1700		1800	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft	5'x20'x5½		→		→		→		→	
7. Probe Position	4' in		→		→				→	
8. Oxygen (%)	8.4		8.8		7.3		7.2		7.6	
9. NOx (hot) read/3% O_2 (ppm)*	31	52	27	57	28	45	26	42	27	45
10. NO (hot) read/3% O_2 (ppm)*	28		26		26		25		26	
11. NO_2 (hot) read/3% O_2 (ppm)*	3	5	1	2	2	3	1	2	1	2
12. NO (cold) read/3% O_2 (ppm)*	33	47	37	55	32	42	31	40	32	43
13. Carbon Dioxide (%)	12.2		15.4		12.8		12.8		13.6	
14. Carbon Monoxide (ppm) uncor/cor*	1160	1657	2000	2951	2220	2628	2000	2639	1480	1988
15. Hydrocarbon (ppm) uncor/cor*	35	59	36	76	35	57	20	32	10	17
16. Sulfur Dioxide (ppm) uncor/cor*	90	152	85	178	84	136	58	94	20	33
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	64°F		64°F		65°F		65°F		65°F	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.76		30.76		30.76		30.76		30.76	
21. Relative Humidity (%)										
22.										
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 5-2-1e

Test No. 5-2-1e Date 9/26/79 Location #5 Engr. Tidona

Unit No. 10 Fuel Hogged Capacity

Unit Type Burner Type

1. Test No.	5-2-1e		→				→			
2. Date	9/26		→				→			
3. Time	1830		1900		1930					
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft	5'x20'x54'				→				→	
7. Probe Position	4' in				→				→	
8. Oxygen (%)	6.3		6.6		4.4					
9. NOx (hot) read/3% O_2 (ppm)*	27	37	33	50	27	35				
10. NO (hot) read/3% O_2 (ppm)*	26		30		25					
11. NO_2 (hot) read/3% O_2 (ppm)*	1	1	3	5	2	2				
12. NO (cold) read/3% O_2 (ppm)*	29	36	36	45	30	33				
13. Carbon Dioxide (%)	13.2		12.4		16.4					
14. Carbon Monoxide (ppm) uncor/cor*	1780	2180	1880	2350	2000	2169				
15. Hydrocarbon (ppm) uncor/cor*	20	27	22	33	39	51				
16. Sulfur Dioxide (ppm) uncor/cor*	30	41	21	32	86	112				
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	64		64		62					
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.74		30.74		30.74					
21. Relative Humidity (%)										
22.										
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA Test No. 5/2-1F

Test No. 5/2-1F Date 10/1/79 Location #5 Engr. TIDONA

Unit No. #10 Fuel Hogged Capacity 200,000 lb/hr.

Unit Type Hogged Fuel Power Blr Burner Type Spreader-Stoker

1. Test No.	5/2-1F		5/2-1F		5/2-1F		5/2-1F			
2. Date	10/1/79		10/1/79		10/1/79		10/1/79			
3. Time	1010		1030		10:50		1120			
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position										
8. Oxygen (%)	5.6		5.6		5.0		5.5			
9. NOx (hot) read/3% O_2 (ppm)*	30	60	25	60	30	60	32	56		
10. NO (hot) read/3% O_2 (ppm)*	28		23		27		31			
11. NO_2 (hot) read/3% O_2 (ppm)*	2	4	2	5	3	6	1	1		
12. NO (cold) read/3% O_2 (ppm)*	48	56	47	55	48	54	47	55		
13. Carbon Dioxide (%)	14.8		14.2		14.8		14.0			
14. Carbon Monoxide (ppm) uncor/cor*	2000+	>2338	2000+	>2338	2000+	>2250	2000+	>2323		
15. Hydrocarbon (ppm) uncor/cor*	265	531	39*	93	30*	60	*–	–		
16. Sulfur Dioxide (ppm) uncor/cor*	5	10	0	0	0	0	0	0		
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	54		56		58		59			
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.85		30.85		30.86		30.86			
21. Relative Humidity (%)										
22.										
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

*HC heater low (250)

*HC heater temp. being brought up - no span.

MOBILE LABORATORY DATA

Test No. 5/2-4A

Test No. 5/2-4A Date 10/3/79 Location #5 #10 Boiler Out Engr. [illegible]

Unit No. 10 Fuel Hogged Capacity

Unit Type Burner Type Spreader Stoker

1. Test No.	5/2-4A		→		→		→		—	
2. Date	10/3/79		→		→		→		→	
3. Time	1200		1215		1230		1350		1430	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft	5½'x20'x5½'		→		→		→		→	
7. Probe Position	4' in		→		→		→		→	
8. Oxygen (%)	7.4		5.6		5.6		6.2		5.8	
9. NOx (hot) read/3% O_2 (ppm)*	33	57	33	49	40	67	34	64	45	67
10. NO (hot) read/3% O_2 (ppm)*	33		33		40		34		45	
11. NO_2 (hot) read/3% O_2 (ppm)*	0	0	0	0	0	0	0	0	0	0
12. NO (cold) read/3% O_2 (ppm)*	43	57	42	49	57	67	53	64	57	67
13. Carbon Dioxide (%)	13.2		14.4		14.4		14.0		14.8	
14. Carbon Monoxide (ppm) uncor/cor*	2000	2647	2000	2338	1760	2057	1580	1922	1920	2274
15. Hydrocarbon (ppm) uncor/cor*	90	138	76	113	110	183	-	-	65	78
16. Sulfur Dioxide (ppm) uncor/cor*	18	31	10	15	10	17	-	-	-	
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	62°		62°		62°		65			
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.75		30.75		30.74		30.69			
21. Relative Humidity (%)										
22.							test/			
23.							Start			
24.										
25.										
26.	BASELINE		→				Start			
27.							LOW O_2		→	
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

Avg. O_2: 5.0%

MOBILE LABORATORY DATA

Test No. 5/2-4A

Test No. 5/2-4A Date 10/3/79 Location #5 Boiler Out Engr. Tidona

Unit No. 10 Fuel Hog fuel Capacity

Unit Type Burner Type

1. Test No.	5/2-4A		→		→		→		→	
2. Date	10/3/79		—		—		—		—	
3. Time	1500		1530		1600		1630		1700	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft	5'x20'x5½'		—		—		—		—	
7. Probe Position	4' in		→		→		→		→	
8. Oxygen (%)	4.4		4.2		3.8		5.2		5.0	
9. NOx (hot) read/3% O_2 (ppm)*	37	61	47	76	40	61	39	67	38	69
10. NO (hot) read/3% O_2 (ppm)*	36		45		39		37		36	
11. NO_2 (hot) read/3% O_2 (ppm)*	1	1	2	3	1	1	2	3	2	4
12. NO (cold) read/3% O_2 (ppm)*	55	60	68	73	57	60	56	64	58	65
13. Carbon Dioxide (%)	15.0		15.4		16.5		14.8		15.2	
14. Carbon Monoxide (ppm) uncor/cor*	2000	2169	2000	2143	2000	2093	2000	2278	1960	2205
15. Hydrocarbon (ppm) uncor/cor*	87	144	70	113	0.0.C.		88	152	78	141
16. Sulfur Dioxide (ppm) uncor/cor*	37	61	32	52	25	38	14	24	10	18
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	66		68		71		71		68	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.69		30.69		30.68		30.67		30.67	
21. Relative Humidity (%)										
22.										
23.										
24.										
25.	Low O_2		→		→		→		→	
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA **Test No.** 5/2-2A

Test No. 5/2-4A **Date** 10/3/79 **Location** #5 Boiler Out **Engr.** Tidona

Unit No. 10 **Fuel** Hogged **Capacity**

Unit Type **Burner Type**

1. Test No.	5/2-4A		→			
2. Date	10/3/79		→			
3. Time	1730		1880			
4. Load						
5. Process Rate						
6. Flue Diam. or Size, ft	5'x20'x55'		→			
7. Probe Position	4' in		→			
8. Oxygen (%)	5.3		4.8			
9. NOx (hot) read/3% O_2 (ppm)*	58	89				
10. NO (hot) read/3% O_2 (ppm)*	58					
11. NO_2 (hot) read/3% O_2 (ppm)*	0	0				
12. NO (cold) read/3% O_2 (ppm)*	78	89	49			
13. Carbon Dioxide (%)	14.8		15.2			
14. Carbon Monoxide (ppm) uncor/cor*	2000	2293	1250			
15. Hydrocarbon (ppm) uncor/cor*	100	154	63			
16. Sulfur Dioxide (ppm) uncor/cor*	–	–	25			
17. Smoke Spot (Bacharach)						
18. Atmos. Temp. (°F/°C)	66					
19. Dew Point Temp. (°F/°C)						
20. Atmos. Pressure (in. Hg)	30.65		VOID			
21. Relative Humidity (%)						
22.						
23.						
24.						
25.	LOW O_2					
26.						
27.						
28.						
29.						
30.						

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 5/3-1

Test No. 5/3-1 Date 10/4/79 Location #5 Engr. TIDONA

Unit No. #10 Fuel ______ Capacity 200,000 lb/hr

Unit Type Hogged Fuel Power Boiler Burner Type Spreader - Stoker

BASELINE

1. Test No.	5/3-1		5/3-2		5/3-2a		5/3-3		5/3-3a	
2. Date	10/4/79		10/4/79		10/4/79		10/4/79		10/4/79	
3. Time	1043		1327		1402		1521			
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position										
8. Oxygen (%)	7.4		4.8		7.7		10.3		7.0	
9. NOx (hot) read/3% O_2 (ppm)*	38	61	37	49	30	53	23	72	26	53
10. NO (hot) read/3% O_2 (ppm)*	38		37		30		23		25	
11. NO_2 (hot) read/3% O_2 (ppm)*	0	0	0	0	0	0	0	0	1	2
12. NO (cold) read/3% O_2 (ppm)*	46	61	44	49	39	53	43	72	40	51
13. Carbon Dioxide (%)	12.6		15.9		12.4		8.9		12.9	
14. Carbon Monoxide (ppm) uncor/cor*	1745	2310	2000+	2222+	2000+	2707+	2000+	3364+	2000+	2571+
15. Hydrocarbon (ppm) uncor/cor*	25	40	85	112	80	141	100	315	35	72
16. Sulfur Dioxide (ppm) uncor/cor*	5	8	0	0	0	0	0	0	0	0
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)										
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)										
21. Relative Humidity (%)										
22.										
23.	Baseline		High Fire		High Fire		1/2 Load		1/2 Load	
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 5/4-1 to 3

Test No. 5/4-1 to 3 Date 10-1-79 Location #5 Engr. TIDONA

Unit No. #10 Fuel Sawdust Capacity 200,000

Unit Type Hogged Fuel Power Blr. Burner Type Spreader - Stoker

1. Test No.	5/4-1		5/4-2		5/4-3		5/4-4			
2. Date	10/1/79		10/1/79		10/1/79		10/1/79			
3. Time	1330		1505		1615		1635			
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position										
8. Oxygen (%)	7.3		8.1		7.4		8.1			
9. NOx (hot) read/3% O_2 (ppm)*	50	85	30	67	26	57	23	58		
10. NO (hot) read/3% O_2 (ppm)*	50		30		24		22			
11. NO_2 (hot) read/3% O_2 (ppm)*	0	0	0	0	2	4	1	2		
12. NO (cold) read/3% O_2 (ppm)*	65	85	48	67	40	53	40	56		
13. Carbon Dioxide (%)	12.8		10.3		11.7		11.0			
14. Carbon Monoxide (ppm) uncor/cor*	860	1130	620	865	1400	1853	930	1298		
15. Hydrocarbon (ppm) uncor/cor*	*		100	223	97	214	35	89		
16. Sulfur Dioxide (ppm) uncor/cor*	0	0	0	0	0	0	0	0		
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	64		68		72		66			
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.85		30.82		30.80		30.80			
21. Relative Humidity (%)										
22.										
23.										
24.	BASELINE		HIGH OFA		ZERO OFA		BASELINE			
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

* being worked on

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 5/4-2A-

Test No. 5/4-2A Date 10-2-79 Location 5 Engr. TIDONA

Unit No. 10 Fuel HOGGED Capacity

Unit Type Burner Type SPREADER- STOKER

1. Test No.	5/4-2A		—		—		—		—	
2. Date	10-2-79	→								
3. Time	11:55		12:30		1315		13:40		14:20	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position										
8. Oxygen (%)	7.9		7.3		6.4		8.0		7.8	
9. NOx (hot) read/3% O_2 (ppm)*	41	64	33	56	32	48	33	53	42	78
10. NO (hot) read/3% O_2 (ppm)*	38		31		29		31		42	
11. NO_2 (hot) read/3% O_2 (ppm)*	3	5	2	3	3	5	2	3	0	0
12. NO (cold) read/3% O_2 (ppm)*	43	59	40	53	35	43	36	50	57	78
13. Carbon Dioxide (%)	14.0		12.0		13.6		12.0		12.0	
14. Carbon Monoxide (ppm) uncor/cor*	990	1360	2000	2628	2000	2466	1240	1717	1540	2100
15. Hydrocarbon (ppm) uncor/cor*	50	78	50	85	60	89	30	48	—	
16. Sulfur Dioxide (ppm) uncor/cor*	20	31	5	8	20	30	20	32	20	37
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)										
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.94	→								
21. Relative Humidity (%)										
22.										
23.	HIGH OVER	→								
24.	FIRE AIR									
25.	OPTIMUM									
26.	CO									
27.	low dry	→							dry rdg	
28.	NO rdgs.								taken 1st	
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 5/4-2A

Test No. 5/4-2A **Date** 10-2-79 **Location** 5 **Engr.** TIDONA

Unit No. 10 **Fuel** HOGGED **Capacity**

Unit Type **Burner Type** Spreader - STOKER

1. Test No.	5/4-2A		→							
2. Date	10-2-79		→							
3. Time	14:50		15:20		15:50					
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position										
8. Oxygen (%)	7.6		8.2		8.2					
9. NOx (hot) read/3% O_2 (ppm)*	43	83	45	86	35	70				
10. NO (hot) read/3% O_2 (ppm)*	42		45		35					
11. NO_2 (hot) read/3% O_2 (ppm)*	1	2	0	0	0	0				
12. NO (cold) read/3% O_2 (ppm)*	60	81	61	86	50	70				
13. Carbon Dioxide (%)	12.0		11.3		11.3					
14. Carbon Monoxide (ppm) uncor/cor*	620	833	1000	1406	1230	1730				
15. Hydrocarbon (ppm) uncor/cor*	—		60	114	60	121				
16. Sulfur Dioxide (ppm) uncor/cor*	20	38	40	76	40	80				
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)										
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)										
21. Relative Humidity (%)										
22.	HIGH over		→							
23.	FIRE AIR									
24.	OPTIMUM									
25.	CO									
26.										
27.	dry rdg.		→							
28.	taken 1st									
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.________

Test No.__________ Date 10/16/79 Location #5 Engr. BUENING

Unit No. 10 Fuel WOOD Capacity 120,000 lb/hr.

Unit Type Hogged Fuel Power Blr. Oil Burner Type Stoker - Spreader.

	5/5-1		5/5-2		5/5-2		5/5-3		5/5-3	
1. Test No.	5/5-1		5/5-2		5/5-2		5/5-3		5/5-3	
2. Date	10/16/79		10/16/79		10/16/79		10/16/79		10/16/79	
3. Time	1320		1420		1510		1545		1555	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft	5'x20'x5½									
7. Probe Position	4' in									
8. Oxygen (%)	8.6		6.0		5.5		7.4		7.3	
9. NOx (hot) read/3% O_2 (ppm)*	43	91	42	60	41	63	34	77	43	85
10. NO (hot) read/3% O_2 (ppm)*	41		42		40		32		42	
11. NO_2 (hot) read/3% O_2 (ppm)*	2	4	0	0	1	1	2	4	1	2
12. NO (cold) read/3% O_2 (ppm)*	60	87	50	60	53	62	55	73	63	83
13. Carbon Dioxide (%)	11.4		13.6		16.0		12.5		13.0	
14. Carbon Monoxide (ppm) uncor/cor*	920	1335	2000+	2400+	1640	1906	1540	2038	ND	–
15. Hydrocarbon (ppm) uncor/cor*	23	49	35	50	30	46	30	68	NL	–
16. Sulfur Dioxide (ppm) uncor/cor*	–		–		–		–			
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	65		64		66		63		63	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.74		30.75		30.78		30.78		30.78	
21. Relative Humidity (%)										
22.										
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

Baseline

Aux. Air Damper "AA" Adjustment

Aux. Air Low O_2

Oil O.F. Air "C" adjustment

Spot Reading

MOBILE LABORATORY DATA

Test No.________

Test No. 5/5-1 **Date** 10/16/79 **Location** #5 **Engr.** BUERING

Unit No. 10 **Fuel** WOOD **Capacity** 250,000 lb/hr.

Unit Type Hogged Fuel Power Boiler **Burner Type** Spreader - Stoker

5/5-1

1. Test No.										
2. Date	10/16/79									
3. Time	1625									
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position										
8. Oxygen (%)	8.0									
9. NOx (hot) read/3% O_2 (ppm)*	43	87								
10. NO (hot) read/3% O_2 (ppm)*	41									
11. NO_2 (hot) read/3% O_2 (ppm)*	2	4								
12. NO (cold) read/3% O_2 (ppm)*	60	83								
13. Carbon Dioxide (%)	12.1									
14. Carbon Monoxide (ppm) uncor/cor*	930	1288								
15. Hydrocarbon (ppm) uncor/cor*	35	71								
16. Sulfur Dioxide (ppm) uncor/cor*	—									
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	62									
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.80									
21. Relative Humidity (%)										
22.										
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

Baseline

MOBILE LABORATORY DATA

Test No. 5/6-1

Test No. 5/6-1 Date 10/15/79 Location #5 Engr. BUENING

Unit No. 10 Fuel 10:1 Capacity 250,000

Unit Type Hogged Fuel Power Blr. Burner Type Spreader - Stoker

1. Test No.	5/6-1		5/6-1		5/6-2		5/6-2			
2. Date	10/15/79		10/15/79		10/15/79		10/15/79			
3. Time	1015		1045		1200		1230			
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft	5'x20' [illegible]									
7. Probe Position	4' in									
8. Oxygen (%)	6.5		6.4		7.1		7.1			
9. NOx (hot) read/3% O_2 (ppm)*	43	76	43	95	52	106	53	92		
10. NO (hot) read/3% O_2 (ppm)*	42		42		49		53			
11. NO_2 (hot) read/3% O_2 (ppm)*	1	2	1	3	3	6	0	0		
12. NO (cold) read/3% O_2 (ppm)*	60	74	75	92	77	100	71	92		
13. Carbon Dioxide (%)	10.7		11.0		9.5		10.2			
14. Carbon Monoxide (ppm) uncor/cor*	1110	1378	1250	1541	420	544	660	855		
15. Hydrocarbon (ppm) uncor/cor*	*45	80	35	77	28	57	25	43		
16. Sulfur Dioxide (ppm) uncor/cor*	—		—		—		—			
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	62		60		64		61			
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.80		30.80		30.81		30.81			
21. Relative Humidity (%)										
22.										
23.										
24.	*HC reading									
25.	at 1030									
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

Baseline #1

Baseline #2

Low Combustion Air Preheat

Low Combustion Air Preheat

MOBILE LABORATORY DATA

Test No.________

Test No.________ Date 10/15/79 Location #5 Engr. BUENING

Unit No. 10 Fuel wood Capacity 120,000 lb/hr.

Unit Type Hogged Fuel Power Boiler Burner Type Spreader - Stoker.

1. Test No.	5/6-2A		5/6-2A		5/6-1A		5/6-1A			
2. Date	10/15/79		10/15/79		10/15/79		10/15/79			
3. Time	1320		1345		1415		1445			
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft	5' x 20' sq									
7. Probe Position	4' in									
8. Oxygen (%)	7.4		7.3		7.9		8.1			
9. NOx (hot) read/3% O_2 (ppm)*	43	90	48	87	42	91	43	79		
10. NO (hot) read/3% O_2 (ppm)*	40		47		41		42			
11. NO_2 (hot) read/3% O_2 (ppm)*	3	7	1	3	1	2	1	2		
12. NO (cold) read/3% O_2 (ppm)*	63	83	65	84	65	89	55	77		
13. Carbon Dioxide (%)	12.0		12.1		12.9		12.9			
14. Carbon Monoxide (ppm) uncor/cor*	800	1059	800	1051	650	893	320	447		
15. Hydrocarbon (ppm) uncor/cor*	23	48	13	24	23	50	22	40		
16. Sulfur Dioxide (ppm) uncor/cor*	–		–		–		–			
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)			62		61		61			
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)			30.80		30.78		30.78			
21. Relative Humidity (%)										
22.										
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

Low Comb. air temp.

Low Comb. air temp.

Baseline – Wood

Baseline #2 Wood

MOBILE LABORATORY DATA

Test No.________

Test No.________ Date 10/17/79 Location #5 Engr. BUENING

Unit No. #10 Fuel WOOD Capacity 250,000 lbs/hr.

Unit Type Hogged Fuel Power Blr. Burner Type Spreader - Stoker

1. Test No.	5/7-1		5/7-2		5/7-2		5/7-2		5/7-2	
2. Date	10/17/79		10/17/79							
3. Time	0940		1015		1045		1130		1215	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft	5'x20'x 56'									
7. Probe Position	4' in									
8. Oxygen (%)	7.3		4.9		5.0		4.1		8.1	
9. NOx (hot) read/3% O_2 (ppm)*	33	76	40	60	37	59	34	46	40	82
10. NO (hot) read/3% O_2 (ppm)*	32		36		34		33		39	
11. NO_2 (hot) read/3% O_2 (ppm)*	1		4		3		1	1	1	2
12. NO (cold) read/3% O_2 (ppm)*	56	74	48	54	48	54	42	45	57	80
13. Carbon Dioxide (%)	14.0		16.5		15.4		16.1		11.8	
14. Carbon Monoxide (ppm) uncor/cor*	OOS		—		—		—		—	
15. Hydrocarbon (ppm) uncor/cor*	25	59	45	67	20	32	O.O.S.		—	
16. Sulfur Dioxide (ppm) uncor/cor*	—		—		—		—		—	
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	58		56		54		56		60	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.91		30.89		30.88		30.85		30.82	
21. Relative Humidity (%)										
22.										
23.										
24.									O_2 drift	
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

Baseline

Low NOx

Low NOx

Low NOx

Low NOx load & O_2 drift; fuel change

MOBILE LABORATORY DATA

Test No.________

Test No.________ Date 10/17/79 Location #~~10~~ 5 Engr. Buening

Unit No. #10 Fuel Wood Capacity 120,000 lb/hr.

Unit Type Hogged Fuel [illegible] Burner Type Spreader - Stoker

1. Test No.	5/7-3		5/7-2		5/7-1					
2. Date	10/17/79		10/17/79		10/17/79					
3. Time	13:10		1445		1500					
4. Load	~~60,000~~									
5. Process Rate										
6. Flue Diam. or Size, ft	5·20·5 ft									
7. Probe Position	4' in									
8. Oxygen (%)	5.2		6.3		6.5					
9. NOx (hot) read/3% O_2 (ppm)*	40	62	46	78	53	86				
10. NO (hot) read/3% O_2 (ppm)*	37		42		50					
11. NO_2 (hot) read/3% O_2 (ppm)*	3	5	4	7	3	5				
12. NO (cold) read/3% O_2 (ppm)*	50	57	58	71	65	81				
13. Carbon Dioxide (%)	17.3		13.6		13.0					
14. Carbon Monoxide (ppm) uncor/cor*	—		—		—					
15. Hydrocarbon (ppm) uncor/cor*	—		—		—					
16. Sulfur Dioxide (ppm) uncor/cor*	—		—		—					
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	60		57		57					
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.83		30.77		30.76					
21. Relative Humidity (%)										
22.										
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

Low NO_x
Partic. + Brink

Low NO_x
Different Wood
O_2 drift

Baseline

MOBILE LABORATORY DATA

Test No.________

Test No.________ Date 10/18/79 Location #5 Engr. BUCNING

Unit No. #10 Fuel WOOD Capacity 250,000 lb/h

Unit Type Hogged Fuel Fir. Boiler Burner Type Spreader - Stoker

1. Test No.	5/7-1A		5/7-2A		5/7-2A		5/7-2A		5/7-2A	
2. Date	10/18/79		10/18/79		10/18/79		10-18-79		10/18/79	
3. Time	09.45		1010		1135		11:50		1265	
4. Load					150,000		160,000		160,000	
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position										
8. Oxygen (%)	8.5		7.5		5.6		4.2		4.0	
9. NOx (hot) read/3% O_2 (ppm)*	28	64	41	77	36	66	30	47	29	40
10. NO (hot) read/3% O_2 (ppm)*	27		39		35		26		27	
11. NO_2 (hot) read/3% O_2 (ppm)*	1	2	2	4	1	2	4	6	2	3
12. NO (cold) read/3% O_2 (ppm)*	43	62	55	73	55	64	38	41	35	37
13. Carbon Dioxide (%)	9.2		13.3		17.8		17.6		16.1	
14. Carbon Monoxide (ppm) uncor/cor*										
15. Hydrocarbon (ppm) uncor/cor*										
16. Sulfur Dioxide (ppm) uncor/cor*										
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	58		56		63		63		60	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.20		30.19		30.18		30.18		30.16	
21. Relative Humidity (%)										
22.										
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

Base-line

Low NOx Wood Change

Low NOx

Low NOx Wood Change

Low NOx

Reproduced from best available copy.

MOBILE LABORATORY DATA

Test No.________

Test No.__________ Date 10/18/79 Location #5 Engr. RUEHLING

Unit No. #10 Fuel WOOD Capacity 250,000 lb/hr

Unit Type Hogg'd Fuel Power Boiler Burner Type Stoker - Spreader

1. Test No.	5/7-2a		5/7-1a							
2. Date	10-18-79		10-18-79							
3. Time	13:40		14:00							
4. Load	155-165		157							
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position										
8. Oxygen (%)	4.4		7.6							
9. NOx (hot) read/3% O_2 (ppm)*	33	47	47	87						
10. NO (hot) read/3% O_2 (ppm)*	30		45							
11. NO_2 (hot) read/3% O_2 (ppm)*	3	5	2	4						
12. NO (cold) read/3% O_2 (ppm)*	39	42	62	83						
13. Carbon Dioxide (%)	16.0		12.0							
14. Carbon Monoxide (ppm) uncor/cor*	-	-	-	-						
15. Hydrocarbon (ppm) uncor/cor*	-	-	-	-						
16. Sulfur Dioxide (ppm) uncor/cor*	-	-	-	-						
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)										
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)										
21. Relative Humidity (%)										
22.										
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

Low NO_x Base-line

Reproduced from best available copy.

MOBILE LABORATORY DATA Test No. 5/7-2B

Test No. 5/7-2B Date 10-22-79 Location 5 Engr. TIDONA

Unit No. 10# Fuel HOGGED Capacity 160,000

Unit Type HOGGED FUEL BOILER Burner Type SPREADER - STOKER

1. Test No.	5/7-1B		5/7-2B		5/7-2B		5/7-2B			
2. Date										
3. Time	15:30		16:15		16.45		17:40			
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position										
8. Oxygen (%)	8.7		5.6		5.5		3.4			
9. NOx (hot) read/3% O_2 (ppm)*	26	61	27	55	28	52	16	21		
10. NO (hot) read/3% O_2 (ppm)*	25		27		28		16			
11. NO_2 (hot) read/3% O_2 (ppm)*	1	2	0	0	0	0	0	0		
12. NO (cold) read/3% O_2 (ppm)*	40	59	47	55	45	52	21	21		
13. Carbon Dioxide (%)	10.6		14.4		14.4		16.0			
14. Carbon Monoxide (ppm) uncor/cor*	1K+	1463+	1K+	1169+	1K+	1161+	1K+			
15. Hydrocarbon (ppm) uncor/cor*	—	—	—		—					
16. Sulfur Dioxide (ppm) uncor/cor*	—	—	—		—					
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	64°F		—		—					
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.30		30.32		30.32		30.40			
21. Relative Humidity (%)										
22.							FUEL CHNGE			
23.							@ 17:00			
24. Condition	BASELINE		LOW NO		LOW NO		LOW NO			
25.	160,000									
26.							NO GOOD!			
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.________

Test No. 5/7- 1c To 2c Date 10/23/79 Location #5 Engr. TIDONA

Unit No. #10 Fuel HOGGED Capacity 250,000 lbs/hr

Unit Type HOGGED FUEL PWR. BLR. Burner Type SPREADER-STOKER

1. Test No.			5/7-1C		5/7-2C				5/7-2C	
2. Date	10/23/79								10/23/79	
3. Time	1730		1745		1820				2315	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position										
8. Oxygen (%)	5.5		7.6		5.3				6.5	
9. NOx (hot) read/3% O_2 (ppm)*	37	67	32	66	31	57			42	64
10. NO (hot) read/3% O_2 (ppm)*	34		30		28				41	
11. NO_2 (hot) read/3% O_2 (ppm)*	3	5	2	4	3	5			1	2
12. NO (cold) read/3% O_2 (ppm)*	53	62	46	62	45	52			50	62
13. Carbon Dioxide (%)	14.2		12.3		14.9				13.7	
14. Carbon Monoxide (ppm) uncor/cor*			1480	1988	1360	1559			1840	2284
15. Hydrocarbon (ppm) uncor/cor*	20	26	50	103	50	92				
16. Sulfur Dioxide (ppm) uncor/cor*										
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)										
19. Dew Point Temp. (°F/°C)	62								54	
20. Atmos. Pressure (in. Hg)	29.87								29.83	
21. Relative Humidity (%)										
22.										
23.										
24. CO			740x2		680x2				920x2	
25. DILUTION			1:1		1:1				1:1	
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

LOW O_2 "AA" AIR DAMPER OFF

BASELINE

LOW AIR PARTICULATES

LOW NO_x
[#6 OIL BEING FIRED TO
MAINTAIN LOAD & STABILITY]

MOBILE LABORATORY DATA Test No.______

Test No. 5/7-2C Date 10/23/79 Location #5 Engr. TIDONA

Unit No. 10 Fuel Hogged: % oil Capacity 250,000 lb/hr

Unit Type Hogged Fuel Power Boiler Burner Type Spreader-Stoker.

1. Test No.	5/7-2C					
2. Date	10/23/79					
3. Time	2345					
4. Load						
5. Process Rate						
6. Flue Diam. or Size, ft						
7. Probe Position						
8. Oxygen (%)	6.8					
9. NOx (hot) read/3% O_2 (ppm)*	38	73				
10. NO (hot) read/3% O_2 (ppm)*	33					
11. NO_2 (hot) read/3% O_2 (ppm)*	5	10				
12. NO (cold) read/3% O_2 (ppm)*	50	63				
13. Carbon Dioxide (%)	13.1					
14. Carbon Monoxide (ppm) uncor/cor*	2700	3423				
15. Hydrocarbon (ppm) uncor/cor*						
16. Sulfur Dioxide (ppm) uncor/cor*						
17. Smoke Spot (Bacharach)						
18. Atmos. Temp. (°F/°C)	52					
19. Dew Point Temp. (°F/°C)						
20. Atmos. Pressure (in. Hg)	29.83					
21. Relative Humidity (%)	[illegible]					
22.						
23.						
24. CO	900x3					
25. Dilution	2:1					
26.						
27.						
28.						
29.						
30.						

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

UNIT OPERATING DATA

Page No. 1 of 2

Test No. 5/1-1 Date 9-17-79 Location 5 Engr.

Unit No. 10 Fuel Hogged + [illegible] Capacity 200,000 # STM/HR (Wood fuel only)
250,000 # STM/HR (Wood + No. 6 oil)

Unit Type HOGGED FUEL POWER BOILER Burner Type SPREADER STOKER

"AS FOUND" TEST - REPEAT

1. Test Number	5/1-1	5/1-1	5/1-1		
2. Date	9-17-79	9-17-79	9-17-79		
3. Time	15:50	18:25	20:52		
4. Load (lb stm/hr)	230,000	220,000	235,000		
5. Process Rate					
6. 400# STM FLOW INTGR. (×100=lb)	1683878	1684467	1684994		
7. 125# STM FLOW INTGR. (×10=lb)	8495772	8497536	8499210		
8. WOOD FLOW INTGR. (×100=lb)	6154480	6156116	6157567		
9. OIL FLOW INTGR (×20=lb)	957750	958358	958760		
10. 400# STM FLOW (from Intgr) - lb/h					
11. 125# STM FLOW (from Intgr) - lb/h					
12. TOT. STM FLOW - lb/h			221722	} from start of test	
13. WOOD FLOW (from Intgr) - lb/h			61331		
14. OIL FLOW (from Intgr) - lb/h			4013		
15. 400# STM FLOW chart - lb/h	235,000	215,000	240,000		
16. 125# STM FLOW chart - lb/h	9000	9,000	9,000		
17. STM. HDR. PRESS. - psig	370	370	370		
18. STM. PRESS. DESUPH OUT - psig	400	410	410		
19. STM TEMP. SUPH - °F	580	600	610		
20. STM. TEMP. DESUPH - °F	550	590	590		
21. TOT. COMB AIR - %	84	83	87		
22. OIL AIR - %	26	26	27		
23. WOOD AIR - %	64	65	74		
24. WOOD FLOW - 10^3 lb/h	65.0	67.0	64.5		
25. OIL FLOW - 10^3 lb/h	2.0	3.0	3.0		
26. OIL PRESS. - psig	60	42	56		
27. OIL TEMP - °F	240	240	240		
28. A.H. GAS IN TEMP. - °F	735	720	730		
29. A.H. GAS OUT TEMP. - °F	465	460	465		
30. A.H. AIR IN TEMP. - °F	150	150	155		

Data Sheet 6002-1

UNIT OPERATING DATA

Page No. 2 of 2

Test No.____ Date____ Location 5 Engr.____

Unit No. 10 Fuel____ Capacity____

Unit Type Hogged Fuel Power Boiler Burner Type____

1. Test Number	5/1-1	5/1-1	5/1-1		
2. Date	9-17-79	9-17-79	9-17-79		
3. Time					
4. Load					
5. Process Rate					
6. A.H. AIR OUT TEMP - °F	540	520	520		
7. F.D. FAN OUT PRESS. - iwg	+11.0	+11.6	+12.3		
8. A.H. IN PRESS. - iwg	+9.0	+9.0	+9.5		
9. A.H. OUT PRESS. - iwg	+6.4	+6.6	+7.0		
10. WINDBOX - LEFT PRESS. - iwg	+2.4	+3.1	+3.0		
11. WINDBOX - RIGHT PRESS. - iwg	+2.5	+3.3	+3.2		
12. OVERFIRE AIR - LEFT PRESS. - iwg	+5.8	+5.5	+5.7		
13. OVERFIRE AIR - RIGHT PRESS. - iwg	+5.8	+5.8	+5.7		
14. UNDERGRATE WINDBOX - LEFT PRESS. iwg	+4.6	+4.5	+5.0		
15. UNDERGRATE WINDBOX - RT. PRESS. - iwg	+4.7	+4.6	+5.2		
16. UNDERGRATE REAR PRESS. - iwg	+1.4	+1.2	+1.4		
17. UNDERGRATE 3rd ZONE PRESS. - iwg	+1.9	+1.4	+1.7		
18. UNDERGRATE 2nd ZONE PRESS. - iwg	+2.0	+1.8	+2.0		
19. UNDERGRATE FRONT PRESS. - iwg	+0.6	+0.7	+0.8		
20. SCRUBBER ΔP - iwg	-12.8	-12.8	-13.0		
21. FURNACE PRESS. - iwg	-0.8	-0.5	-0.5		
22. A.H. GAS OUT PRESS. - iwg	-9.0	-8.5	-9.0		
23. BLR. OUT PRESS. - iwg	-4.9	-4.4	-5.0		
24. DUST COLL. OUT PRESS. - iwg	-12.5	-12.5	-13.2		
25. I.D. FAN OUT PRESS. - iwg	+17.0	+17.0	+17.0		
26. OPACITY - %	I.O.O.S	→	→		
27. OXYGEN - %	7.3	9.8	9.3		
28. COMBUSTIBLES - %	0	0	0		
29.					
30. COMMENTS	PARTICULATES	→	→		

Data Sheet 6002-1

UNIT OPERATING DATA

~~Sheet~~ Page No. 1 of 2

Test No. 5/2-1A and 5/2-4 Date 9/21/79 Location 5 Engr. Tidona

Unit No. 10 Fuel HOGGED WOOD Capacity 200,000 # STM/HR (Wood fuel only) 250,000 # STM/HR (Wood + No. 6 oil)

Unit Type HOGGED FUEL POWER BOILER Burner Type SPREADER STOKER

EXCESS O_2 VARIATIONS

1. Test Number	5/2-1A	5/2-4			
2. Date	9/21/79	9/21/79			
3. Time	15:44	16:14			
4. Load	160,000	160,000			
5. Process Rate					
6. 400# STM FLOW INTGR. (x100 = lb)	170 2105	1702183			
7. 125# STM FLOW INTGR. (x10 = lb)	8575378	8575624			
8. WOOD FLOW INTGR. (x100 = lb)	620 7647	620 8037			
9. OIL FLOW INTGR (x20 = lb)	972786	972786			
10. 400# STM FLOW (from Intgr) - lb/h					
11. 125# STM FLOW (from Intgr) - lb/h					
12. TOT. STM FLOW - lb/h		152 500	from start of test		
13. WOOD FLOW (from Intgr) - lb/h		76 167			
14. OIL FLOW (from Intgr) - lb/h		0			
15. 400# STM FLOW - lb/h	160,000	175,000			
16. 125# STM FLOW - lb/h	8700	4300			
17. STM. HDR. PRESS. - psig	375	380			
18. STM. PRESS. DESUPH OUT - psig	400	410			
19. STM. TEMP. SUPH - °F	620	635			
20. STM. TEMP. DESUPH - °F	600	600			
21. TOT. COMB AIR - %	67	57			
22. OIL AIR - %	0	0			
23. WOOD AIR - %	67	55			
24. WOOD FLOW - 10^3 lb/h	80.0	79.5			
25. OIL FLOW - 10^3 lb/h	0	0			
26. OIL PRESS. - psig	0	0			
27. OIL TEMP - °F	0	0			
28. A.H. GAS IN TEMP. - °F	700	700			
29. A.H. GAS OUT TEMP. - °F	470	470			
30. A.H. AIR IN TEMP. - °F	150	150			

Data Sheet 6002-1

UNIT OPERATING DATA

Page ~~Sheet~~ No. 2 of 2

Test No. ____ Date ____ Location 5 Engr. ____

Unit No. 10 Fuel ____ Capacity ____

Unit Type Hogged Fuel Power Boiler Burner Type ____

1. Test Number	5/2-1A	5/2-4			
2. Date	9/21/79	9/21/79			
3. Time					
4. Load	160,000	160,000			
5. Process Rate					
6. A.H. Air out Temp - °F	540	540			
7. F.D. Fan out Press. - iwg	7.5	5.0			
8. A.H. in Press. - iwg	6.0	4.0			
9. A.H. out Press. - iwg	4.5	3.0			
10. Windbox - Left Press. - iwg	09	0.0			
11. Windbox - Right Press. - iwg	1.2	0.0			
12. Overfire Air - Left Press. - iwg	4.0	3.8			
13. Overfire Air - Right Press. - iwg	4.0	3.8			
14. Undergrate Windbox - Left Press. iwg	2.8	1.2			
15 Undergrate Windbox - Rt. Press. - iwg	2.8	1.2			
16. Undergrate Rear Press. - iwg	0.5	0.3			
17. Undergrate 3rd Zone Press. - iwg	0.8	0.5			
18. Undergrate 2nd Zone Press. - iwg	1.0	0.6			
19. Undergrate Front Press. - iwg	0.4	0.1			
20. Scrubber ΔP - iwg	-12.7	-13.0			
21. Furnace Press. - iwg	-0,45	-0.2			
22. A.H. Gas out Press. - iwg	-6.8	-6.0			
23. Blr. out Press. - iwg	-3.6	-3.4			
24. Dust Coll. out Press. - iwg	-9.2	-7.5			
25. I.D. Fan out Press. - iwg	+16.0	+19.0			
26. Opacity - %	I.O.O.S.	I.O.O.S			
27. Oxygen - %	5.5	3.5			
28. Combustibles - %	0	0			
29. OFA levels	4th	4th			
30. Comments	Repeat Baseline	Lowest O_2			

Data Sheet 6002-1

UNIT OPERATING DATA

Page No. 1 of 2

Test No. 5/9-1 5/2-1A to 3 Date 9/21/79 Location 5 Engr. Tidam

Unit No. 10 Fuel No.6 OIL + HOGGED. WOOD Capacity 200,000 # STM/HR (Wood fuel only) 250,000 # STM/HR (Wood + No. 6 oil)

Unit Type HOGGED FUEL POWER BOILER Burner Type SPREADER STOKER

← OIL + WOOD → | ← WOOD ONLY →

EXCESS O_2 VARIATIONS

1. Test Number	5/9-1	5/9-1	5/2-1A	5/2-2	5/2-3
2. Date	9/21/79	9/21/79	9/21/79	9/21/79	9/21/79
3. Time	12:06	12:41	13:50	14:30	15:18
4. Load (lb stm/hr)	225,000	225,000	160,000	160,000	160,000
5. Process Rate					
6. 400# STM FLOW INTGR. (×100 = lb)	1701494	1701631	1701817		1702078
7. 125# STM FLOW INTGR. (×10 = lb)	8573020	8573513	8574360		8575100
8. WOOD FLOW INTGR. (×100 = lb)	6205057	6205457	6206209		6207316
9. OIL FLOW INTGR (×20 = lb)	972462	972660	972486		972786
10. 400# STM FLOW (from Intgr) - lb/h	BEGIN	216316	BEGIN		
11. 125# STM FLOW (from Intgr) - lb/h					
12. TOT. STM FLOW - lb/h	BEGIN	216,316	BEGIN	–	
13. WOOD FLOW (from Intgr) - lb/h	BEGIN	63158	BEGIN		
14. OIL FLOW (from Intgr) - lb/h	BEGIN	6253	BEGIN		
15. 400# STM FLOW - lb/h	225,000	200,000	160,000	160,000	160,000
16. 125# STM FLOW - lb/h	8200	7200	6800	6800	6800
17. STM. HDR. PRESS. - psig	375	375	375	375	380
18. STM. PRESS, DESUPH OUT - psig	425	400	400	400	400
19. STM. TEMP. SUPH - °F	595	600	630	620	615
20. STM. TEMP. DESUPH - °F	580	570	600	595	585
21. TOT. COMB AIR - %	90	90	67	55	84
22. OIL AIR - %	36	36	0	0	0
23. WOOD AIR - %	65	65	65	55	82
24. WOOD FLOW - 10^3 lb/h	67.0	66.0	75.0	80.0	80.0
25. OIL FLOW - 10^3 lb/h	7.0	6.0	0	0	0
26. OIL PRESS. - psig	79	55	0	0	0
27. OIL TEMP - °F	240	240	0	0	0
28. A.H. GAS IN TEMP. - °F	745	725	700	700	735
29. A.H. GAS OUT TEMP. - °F	475	470	460	465	470
30. A.H. AIR IN TEMP. - °F	150	140	165	140	150

Data Sheet 6002-1

UNIT OPERATING DATA

Page ~~Sheet~~ No. 2 of 2

Test No.______ Date______ Location 5 Engr.______

Unit No. 10 Fuel______ Capacity______

Unit Type HOGGED FUEL POWER BOILER Burner Type______

1. Test Number	5/9-1	5/9-1	5/2-1A	5/2-2	5/2-3
2. Date	9/21/79	9/21/79	9/21/79	9/21/79	9/21/79
3. Time					
4. Load	225,000	225,000	160,000	160,000	160,000
5. Process Rate					
6. A.H. AIR OUT TEMP - °F	540	530	530	530	530
7. F.D. FAN OUT PRESS. - iwg	13.0	13.0	+7.0	6.0	12.0
8. A.H. IN PRESS. - iwg	10.0	10.0	+6.0	5.0	10.0
9. A.H. OUT PRESS. - iwg	7.0	7.0	+4.5	4.0	7.0
10. WINDBOX - LEFT PRESS. - iwg	4.5	4.7	+0.6	0.0	1.5
11. WINDBOX - RIGHT PRESS. - iwg	4.5	4.7	+0.8	0.0	1.6
12. OVERFIRE AIR - LEFT PRESS. - iwg	6.0	6.3	+5.0	4.0	5.8
13. OVERFIRE AIR - RIGHT PRESS. - iwg	6.0	6.3	+5.0	4.0	5.8
14. UNDERGRATE WINDBOX - LEFT PRESS. - iwg	5.2	5.2	+2.6	2.3	5.1
15. UNDERGRATE WINDBOX - RT. PRESS. - iwg	5.2	5.2	+2.6	2.3	5.1
16. UNDERGRATE REAR PRESS. - iwg	1.5	1.2	+0.7	0.3	1.4
17. UNDERGRATE 3rd ZONE PRESS. - iwg	2.0	1.6	+1.0	0.6	1.8
18. UNDERGRATE 2nd ZONE PRESS. - iwg	2.2	2.0	+1.1	0.7	2.0
19. UNDERGRATE FRONT PRESS. - iwg	0.9	0.8	+0.3	0.0	0.8
20. SCRUBBER ΔP - iwg	-13.0	-13.0	-13.0	-13.0	-12.7
21. FURNACE PRESS. - iwg	-0.35	-0.35	-0.5	-0.4	-0.4
22. A.H. GAS OUT PRESS. - iwg	-9.5	-9.3	-9.2	-9.1	-9.0
23. BLR. OUT PRESS. - iwg	-5.4	-5.3	-3.6	-4.3	-5.2
24. DUST COLL. OUT PRESS. - iwg	-14.0	-14.0	-9.0	-8.0	-13.0
25. I.D. FAN OUT PRESS. - iwg	+17.0	+17.0	+16.0	+16.0	+16.5
26. OPACITY - %	I.0.0.S	I.0.0.S	I.0.0.S	I.0.0.S	I.0.0.S
27. OXYGEN - %	6.0	6.0	5.6	4.5	7.0
28. COMBUSTIBLES - %	0	0	0	0	0
29. OFA levels	4th only	4th	4th	4th	4th
30. COMMENTS			BASELINE	LOW O_2	HIGH O_2

Data Sheet 6002-1

UNIT OPERATING DATA

Page No. 1 of 2

Test No. 5/2-1B Date 9/20/79 Location 5 Engr.

Unit No. 10 Fuel HOGGED. WOOD Capacity 200,000 # STM/HR (Wood fuel only) 250,000 # STM/HR (Wood + No. 6 oil)

Unit Type HOGGED FUEL POWER BOILER Burner Type SPREADER STOKER

BASELINE BRINK PARTIC. →

1. Test Number	5/2-1B	5/2-1B	5/2-1B	5/2-1B	
2. Date	9/20/79	9/20/79	9/20/79	9/20/79	
3. Time	12:30	14:56	16:20	17:40	
4. Load (lb stm/hr)	160,000	160,000	160,000	160,000	
5. Process Rate					
6. 400# STM FLOW INTGR. (×1000=lb)	1697317	1697646	1697830	1697997	
7. 125# STM FLOW INTGR. (×10=lb)	8551448	8553257	8554330	8555156	
8. WOOD FLOW INTGR. (×100=lb)	6190345	6191914	6192825	6193528	
9. OIL FLOW INTGR (×20=lb)	967964	967964	967964	967964	
10. 400# STM FLOW (from Intgr.) - lb/h					
11. 125# STM FLOW (from Intgr.) - lb/h					
12. TOT. STM FLOW - lb/h				131613	from start
13. WOOD FLOW (from Intgr) - lb/h				61606	of test
14. OIL FLOW (from Intgr) - lb/h				0	
15. 400# STM FLOW - lb/h	170,000	150,000	140,000	130,000	
16. 125# STM FLOW - lb/h	10,000	9,300	10,000	9600	
17. STM. HDR. PRESS. - psig	370	370	365	360	
18. STM. PRESS. DESUPH OUT - psig	400	400	385	385	
19. STM. TEMP. SUPH - °F	610	600	600	600	
20. STM. TEMP. DESUPH - °F	590	570	585	580	
21. TOT. COMB AIR - %	78	89	67	65	
22. OIL AIR - %	0	0	0	0	
23. WOOD AIR - %	77	88	63	55	
24. WOOD FLOW - 10^3 lb/h	60.0	87.0	60.0	51.5	
25. OIL FLOW - 10^3 lb/h	0	0	0	0	
26. OIL PRESS. - psig	0	0	0	0	
27. OIL TEMP - °F	0	0	0	0	
28. A.H. GAS IN TEMP. - °F	750	735	660	670	
29. A.H. GAS OUT TEMP. - °F	480	460	440	440	
30. A.H. AIR IN TEMP. - °F	150	150	155	170	

Data Sheet 6002-1

UNIT OPERATING DATA

Page ~~Sheet~~ No. 2 of 2

Test No. ____ Date ____ Location 5 Engr. ____

Unit No. 10 Fuel ____ Capacity ____

Unit Type Hogged Fuel Power Boiler Burner Type ____

BRINK PARTIC →

1. Test Number	5/2-1b	5/2-1b	5/2-1b	5/2-1b	
2. Date	9/20/79	9/20/79	9/20/79	9/20/79	
3. Time					
4. Load (lb stm/hr)	160,000	160,000	160,000	160,000	
5. Process Rate					
6. A.H. AIR OUT TEMP - °F	545	510	505	510	
7. F.D. FAN OUT PRESS. - iwg	8.0	18.5	+7.5	6.5	
8. A.H. IN PRESS. - iwg	6.3	14.0	6.0	4.0	
9. A.H. OUT PRESS. - iwg	4.5	10.5	4.0	2.5	
10. WINDBOX - LEFT PRESS. - iwg	0.4	3.0	0.0	0.0	
11. WINDBOX - RIGHT PRESS. - iwg	0.6	3.1	0.0	0.0	
12. OVERFIRE AIR - LEFT PRESS. - iwg	3.6	9.4	3.0	3.0	
13. OVERFIRE AIR - RIGHT PRESS. - iwg	3.6	9.4	3.0	3.0	
14. UNDERGRATE WINDBOX - LEFT PRESS. - iwg	3.0	8 0	2.4	2.3	
15. UNDERGRATE WINDBOX - RT. PRESS. - iwg	3.0	8 0	2.4	2.3	
16. UNDERGRATE REAR PRESS. - iwg	0.9	2.5	0.5	0.1	
17. UNDERGRATE 3rd ZONE PRESS. - iwg	1.1	3.0	0.7	0.2	
18. UNDERGRATE 2nd ZONE PRESS. - iwg	1.2	3.7	0.8	0.2	
19. UNDERGRATE FRONT PRESS. - iwg	0.2	2.0	0.0	0.0	
20. SCRUBBER ΔP - iwg					
21. FURNACE PRESS. - iwg	-0.3	+0.2	-1.1	-0.3	
22. A.H. GAS OUT PRESS. - iwg	-5.6	-9.6	-7.0	-5.5	
23. BLR. OUT PRESS. - iwg	-3.1	-5.2	-3.7	-2.5	
24. DUST COLL. OUT PRESS. - iwg	-7.5	-14.5	-8.8	-7.0	
25. I.D. FAN OUT PRESS. - iwg	+16.0	+17.0	+16.0	+19.0	
26. OPACITY - %	I.O.O.S.	I.O.O.S	I.O.O.S	I.O.O.S.	
27. OXYGEN - %	8.2	9.5	7.0	7.5	
28. COMBUSTIBLES - %	0	0.3	0	0	
29. OFA levels	4th only	4th	4th	4th	
30. COMMENTS	BRINK	PARTIC. →			

Data Sheet 6002-1

UNIT OPERATING DATA

Page No. 1 of 2

Test No. 5/2-1C Date 9/24/79 Location 5 Engr. Tilona

Unit No. 10 Fuel No. 6 + HOGGED WOOD Capacity 200,000 # STM/HR (Wood fuel only) 250,000 # STM/HR (Wood + No. 6 oil)

Unit Type HOGGED FUEL POWER BOILER Burner Type SPREADER STOKER

D.C. EFFICIENCY AT BASELINE

1. Test Number	5/2-1C	5/2-1C	5/2-1C	5/2-1C	
2. Date	9/24/79	9/24/79	9/24/79	9/24/79	
3. Time	15:30	17:07	19:20	20:02	
4. Load	160,000	160000	160000	160000	
5. Process Rate					
6. 400# STM FLOW INTGR. (×100 = lb)	1713866	1714035	1714297	1714384	
7. 125# STM FLOW INTGR. (×10 = lb)	8637219	8638505	8640352	8640950	
8. WOOD FLOW INTGR. (×100 = lb)	6252958	6253885	6255145	6255552	
9. OIL FLOW INTGR (×20 = lb)	985194	985376	985625	985703	
10. 400# STM FLOW (from Intgr) - lb/h				114265	
11. 125# STM FLOW (from Intgr) - lb/h					from start
12. TOT. STM FLOW - lb/h				114265	
13. WOOD FLOW (from Intgr) - lb/h				11444	
14. OIL FLOW (from Intgr) - lb/h				2246	
15. 400# STM FLOW - lb/h	120000	135000	135000	140000	
16. 125# STM FLOW - lb/h	8200	7600	9200		
17. STM. HDR. PRESS. - psig	370	380	380	390	
18. STM. PRESS, DESUPH OUT - psig	395	405	400	415	
19. STM TEMP SUPH - °F	635	650	630	645	
20. STM. TEMP, DESUPH - °F	605	600	600	605	
21. TOT. COMB AIR - %	63.5	63	77	65	
22. OIL AIR - %	18.5	78	22	18	
23. WOOD AIR - %	50	49	60	51	
24. WOOD FLOW - 10^3 lb/h	74.5	60.0	61.5	61	
25. OIL FLOW - 10^3 lb/h	1.4	1.2	2.0	1.6	
26. OIL PRESS. - psig	55	48	60	44	
27. OIL TEMP - °F	240	240	240	240	
28. A.H. GAS IN TEMP. - °F	635	640	670	680	
29. A.H. GAS OUT TEMP. - °F	430	440	440	455	
30. A.H. AIR IN TEMP. - °F	180	180	170	180	

Data Sheet 6002-1

UNIT OPERATING DATA

No._______

Test No. 5/2-1C Date_______ Location 5 Engr._______

Unit No. 10 Fuel_______ Capacity_______

Unit Type HOGGED FUEL POWER BOILER Burner Type_______

1. Test Number	5/2-1C	5/2-1C	5/2-1C	5/2-1C	
2. Date	9/24/79	9/24/79	9/24/79	9/24/79	
3. Time					
4. Load	160,000	160000	160000	160000	
5. Process Rate					
6. A.H. AIR OUT TEMP - °F	500	500	500	520	
7. F.D. FAN OUT PRESS. - iwg	6.5	6.5	9.5	6.5	
8. A.H. IN PRESS. - iwg	5.0	5.0	7.5	5.5	
9. A.H. OUT PRESS. - iwg	3.5	3.5	5.5	4.5	
10. WINDBOX - LEFT PRESS. - iwg	1.0	0.9	1.6	1.2	
11. WINDBOX - RIGHT PRESS. - iwg	1.2	1.0	1.8	1.2	
12. OVERFIRE AIR - LEFT PRESS. - iwg	3.0	3.0	4.6	3.2	
13. OVERFIRE AIR - RIGHT PRESS. - iwg	3.0	3.0	4.6	3.2	
14. UNDERGRATE WINDBOX - LEFT PRESS. - iwg	2.2	2.3	3.5	2.5	
15. UNDERGRATE WINDBOX - RT. PRESS. - iwg	2.4	2.5	3.6	2.5	
16. UNDERGRATE REAR PRESS. - iwg	0.5	0.5	0.8	0.6	
17. UNDERGRATE 3rd ZONE PRESS. - iwg	0.6	0.6	1.1	0.8	
18. UNDERGRATE 2nd ZONE PRESS. - iwg	0.7	0.7	1.2	0.9	
19. UNDERGRATE FRONT PRESS. - iwg	0.1	0.1	0.2	0.2	
20. SCRUBBER ΔP - iwg	-13.0	-13.0	-13.0	-13.0	
21. FURNACE PRESS. - iwg	-0.3	-0.3	-0.4	-0.5	
22. A.H. GAS OUT PRESS. - iwg	-6.5	-6.2	-7.5	-6.5	
23. BLR. OUT PRESS. - iwg	-3.5	-3.4	-4.5	-3.5	
24. DUST COLL. OUT PRESS. - iwg	-8.5	-8.5	-10.5	-8.3	
25. I.D. FAN OUT PRESS. - iwg	+20.0	+20.0	+17.0	+16.0	
26. OPACITY - %	I.O.O.S.	I.O.O.S.	I.O.O.S.	I.O.O.S.	
27. OXYGEN - %	8.0	7.2	7.5	7.0	
28. COMBUSTIBLES - %	4.0	2.0	4.0	4.0	
29. OFA levels	4th	4th	4th	4th	
30. COMMENTS	BASELINE (BAD WOOD)	BASELINE	BASELINE	BASELINE	

Data Sheet 6002-1

UNIT OPERATING DATA

~~Sheet~~ Page No. 1 of 2

Test No. 5/2-1d Date 9-25-79 Location 5 Engr. TIDONA

Unit No. 10 Fuel HOGGED. Capacity 200,000 # STM/HR (Wood fuel only) 250,000 # STM/HR (Wood + No.6 oil)

Unit Type HOGGED FUEL POWER BOILER Burner Type SPREADER STOKER

	BRINK → (SOME NO.6 OIL)		ALL WOOD GOKSOYR-ROSS →		
1. Test Number	5/2-1d	5/2-1d	5/2-1d	5/2-1d	
2. Date	9/25/79	9/25/79	9/25/79	9/25/79	
3. Time	11:51	13:42	16:09	18:09	
4. Load	160000	160000	160000	160000	
5. Process Rate					
6. 400# STM FLOW INTGR. (×1000=lb)	1716725	1717017	1717429	1717726	
7. 125# STM FLOW INTGR. (×10=lb)	8655950		8659033	8660074	
8. WOOD FLOW INTGR. (×100=lb)	6262878		6265488	6266622	
9. OIL FLOW INTGR (×20=lb)	987533	987695	987875	997875	
10. 400# STM FLOW (from Intgr) - lb/h		157838		148500	158889
11. 125# STM FLOW (from Intgr) - lb/h					
12. TOT. STM FLOW - lb/h			from start of SOx test		
13. WOOD FLOW (from Intgr) - lb/h				56700	59429
14. OIL FLOW (from Intgr) - lb/h		1751		0	
15. 400# STM FLOW - lb/h	170000	160000	170000	165000	
16. 125# STM FLOW - lb/h	10700	7500	5500	4400	
17. STM. HDR. PRESS. - psig	390	385	380	390	
18. STM. PRESS. DESUPH OUT - psig	420	420	420	415	
19. STM. TEMP. SUPH - °F	650	635	650	635	
20. STM. TEMP. DESUPH - °F	605	605	610	600	
21. TOT. COMB AIR - %	85	83	73	81.5	
22. OIL AIR - %	27	26	0	0	
23. WOOD AIR - %	66	65	71.5	80	
24. WOOD FLOW - 10^3 lb/h	59.0	59.0	65.0	58.0	
25. OIL FLOW - 10^3 lb/h	1.1	1.1	0	0	
26. OIL PRESS. - psig	47	47	0	0	
27. OIL TEMP - °F	242	242	0	0	
28. A.H. GAS IN TEMP. - °F	715	705	715	720	
29. A.H. GAS OUT TEMP. - °F	470	460	480	475	
30. A.H. AIR IN TEMP. - °F	180	155	150	135	

overall

Data Sheet 6002-1

UNIT OPERATING DATA

Page ~~Sheet~~ No. 2 of 2

Test No. ______ Date ______ Location 5 ______ Engr. ______

Unit No. 10 ______ Fuel ______ Capacity ______

Unit Type HOGGED FUEL POWER BOILER ______ Burner Type ______

1. Test Number	5/2-1d	5/2-1d	5/2-1d	5/2-1d	
2. Date	9/25/79	9/25/79	9/25/79	9/25/79	
3. Time					
4. Load	160000	160000	160000	160000	
5. Process Rate					
6. A.H. AIR OUT TEMP - °F	530	530	550	535	
7. F.D. FAN OUT PRESS. - iwg	12.0	11.7	10.5	11.5	
8. A.H. IN PRESS. - iwg	9.0	9.0	8.5	9.0	
9. A.H. OUT PRESS. - iwg	6.5	6.5	6.5	6.5	
10. WINDBOX - LEFT PRESS. - iwg	2.3	2.2	1.5	0.8	
11. WINDBOX - RIGHT PRESS. - iwg	2.3	2.3	1.5	1.1	
12. OVERFIRE AIR - LEFT PRESS. - iwg	5.7	5.7	5.6	5.5	
13. OVERFIRE AIR - RIGHT PRESS. - iwg	5.7	5.7	5.6	5.5	
14. UNDERGRATE WINDBOX - LEFT PRESS. - iwg	4.8	4.8	4.8	4.8	
15 UNDERGRATE WINDBOX - RT. PRESS. - iwg	4.8	5.0	4.8	4.8	
16. UNDERGRATE REAR PRESS. - iwg	1.4	1.6	2.0	1.5	
17. UNDERGRATE 3rd ZONE PRESS. - iwg	1.8	2.1	2.4	1.9	
18. UNDERGRATE 2nd ZONE PRESS. - iwg	1.9	2.2	2.6	2.0	
19. UNDERGRATE FRONT PRESS. - iwg	0.9	0.9	1.3	1.0	
20. SCRUBBER ΔP - iwg	-13.0	-13.0	-12.8	-13.0	
21. FURNACE PRESS. - iwg	-0.4	-0.6	-0.2	-0.2	
22. A.H. GAS OUT PRESS. - iwg	-9.5	-9.2	-8.5	-9.0	
23. BLR. OUT PRESS. - iwg	-5.4	-5.2	-4.6	-4.8	
24. DUST COLL. OUT PRESS. - iwg	-13.3	-12.5	-11.5	-12.5	
25. I.D. FAN OUT PRESS. - iwg	+17.0	+17.0	+16.0	+17.0	
26. OPACITY - %	I.O.O.S.	I.O.O.S.	I.O.O.S.	I.O.O.S.	
27. OXYGEN - %	5.5	6.0	5.5	5.7	
28. COMBUSTIBLES - %	4.0	4.0	4.0	4.0	
29. OFA levels	4th	4th	4th	4th	
30. COMMENTS	BASELINE	BASELINE	BASELINE	BASELINE	

FIRING A LITTLE NO. 6 OIL → | ALL WOOD → |

Data Sheet 6002-1

UNIT OPERATING DATA

Page No. 1 of 2

Test No. 5/2-1E **Date** 9/26/79 **Location** 5 **Engr.**

Unit No. 10 **Fuel** HOGGED WOOD **Capacity** 200,000 # STM/HR (Wood fuel only) 250,000 # STM/HR (Wood + No.6 oil)

Unit Type HOGGED FUEL POWER BOILER **Burner Type** SPREADER STOKER

POM Test

1. Test Number	5/2-1E	5/2-1E	5/2-1E		
2. Date	9/26/79	9/26/79	9/26/79		
3. Time	15:50	19:15	19:51		
4. Load	160000	160000	160000		
5. Process Rate					
6. 400# STM FLOW INTGR. (x1000=lb)	1721901	1722380	1722462		
7. 125# STM FLOW INTGR. (x10=lb)	8675661	8677730	8678090		
8. WOOD FLOW INTGR. (x100=lb)	6278098	6280394	6280796		
9. OIL FLOW INTGR (x20=lb)	991862	991862	991862		
10. 400# STM FLOW (from Intgr) - lb/h					
11. 125# STM FLOW (from Intgr) - lb/h					
12. TOT. STM FLOW - lb/h			139668		
13. WOOD FLOW (from Intgr) - lb/h			67170	from start	
14. OIL FLOW (from Intgr) - lb/h			0		
15. 400# STM FLOW - lb/h	155000	145000	150000		
16. 125# STM FLOW - lb/h	8500	6600	5400		
17. STM. HDR. PRESS. - psig	375	385	385		
18. STM. PRESS., DESUPH OUT - psig	415	415	415		
19. STM. TEMP. SUPH - °F	650	635	625		
20. STM. TEMP., DESUPH - °F	610	610	605		
21. TOT. COMB AIR - %	67	67	67		
22. OIL AIR - %	0	0	0		
23. WOOD AIR - %	67	67	67		
24. WOOD FLOW - 10^3 lb/h	70	70	70		
25. OIL FLOW - 10^3 lb/h	0	0	0		
26. OIL PRESS. - psig	0	0	0		
27. OIL TEMP - °F	0	0	0		
28. A.H. GAS IN TEMP. - °F	680	690	695		
29. A.H. GAS OUT TEMP. - °F	455	460	465		
30. A.H. AIR IN TEMP. - °F	180	160	145		

Data Sheet 6002-1

UNIT OPERATING DATA Page ~~Sheet~~ No. 2 of 2

Test No._______ Date_______ Location 5 Engr._______

Unit No. 10 Fuel_______ Capacity_______

Unit Type Hogged Fuel Power Boiler Burner Type_______

1. Test Number	5/2-1E	5/2-1E	5/2-1E		
2. Date	9/26/79	9/26/79	9/26/79		
3. Time					
4. Load	160000	160000	160000		
5. Process Rate					
6. A.H. AIR OUT TEMP - °F	520	530	540		
7. F.D. FAN OUT PRESS. - iwg	7.8	7.3	7.5		
8. A.H. IN PRESS. - iwg	6.0	6.0	6.0		
9. A.H. OUT PRESS. - iwg	4.5	4.5	4.5		
10. WINDBOX - LEFT PRESS. - iwg	0.5	0.5	0.3		
11. WINDBOX - RIGHT PRESS. - iwg	0.7	0.8	0.7		
12. OVERFIRE AIR - LEFT PRESS. - iwg	3.7	3.7	3.7		
13. OVERFIRE AIR - RIGHT PRESS. - iwg	3.7	3.7	3.7		
14. UNDERGRATE WINDBOX - LEFT PRESS. - iwg	3.2	3.0	3.0		
15. UNDERGRATE WINDBOX - RT. PRESS. - iwg	3.2	3.0	3.0		
16. UNDERGRATE REAR PRESS. - iwg	0.9	0.8	0.8		
17. UNDERGRATE 3rd ZONE PRESS. - iwg	1.1	1.1	1.1		
18. UNDERGRATE 2nd ZONE PRESS. - iwg	1.4	1.2	1.2		
19. UNDERGRATE FRONT PRESS. - iwg	0.5	0.4	0.4		
20. SCRUBBER ΔP - iwg	-12.6	-13.0	-13.0		
21. FURNACE PRESS. - iwg	-0.4	-0.45	-0.4		
22. A.H. GAS OUT PRESS. - iwg	-7.2	-6.8	-7.3		
23. BLR. OUT PRESS. - iwg	-4.2	-3.8	-4.0		
24. DUST COLL. OUT PRESS. - iwg	-9.5	-9.2	-9.5		
25. I.D. FAN OUT PRESS. - iwg	+16.0	+16.0	+16.5		
26. OPACITY - %	I.O.O.S.	I.O.O.S.	I.O.O.S.		
27. OXYGEN - %	5.0	5.0	6.0		
28. COMBUSTIBLES - %	4.0	4.0	4.0		
29. OFA levels	4th	4th	4th		
30. COMMENTS	BASELINE	——	——→		

Data Sheet 6002-1

UNIT OPERATING DATA

Page No. 1 of 2

Test No. 5/2-1F Date 10/1/79 Location 5 Engr. T. Long

Unit No. 10 Fuel Hogged. Wood Capacity 200,000 # STM/HR (Wood fuel only) 250,000 # STM/HR (Wood + No. 6 oil)

Unit Type Hogged Fuel Power Boiler Burner Type Spreader Stoker

BRINK →

1. Test Number	5/2-1F	5/2-1F			
2. Date	10/1/79	10/1/79			
3. Time	09:27	11:30			
4. Load	160000	160000			
5. Process Rate					
6. 400# STM Flow Intgr. (×1000 = lb)	1740336	1740679			
7. 125# STM Flow Intgr. (×10 = lb)	8762349	8763878			
8. Wood Flow Intgr. (×100 = lb)	6339737	6341166			
9. Oil Flow Intgr (×20 = lb)	1006134	1006134			
10. 400# STM Flow (from Intgr) - lb/h					
11. 125# STM Flow (from Intgr) - lb/h					
12. Tot. STM Flow - lb/h		167317			
13. Wood Flow (from Intgr) - lb/h		69707			
14. Oil Flow (from Intgr) - lb/h		0			
15. 400# STM Flow - lb/h	160000	190000			
16. 125# STM Flow - lb/h	7200	6500			
17. STM. HDR. Press. - psig	365	365			
18. STM. Press. Desuph Out - psig	390	390			
19. STM. Temp. Suph - °F	650	640			
20. STM. Temp. Desuph - °F	605	600			
21. Tot. Comb Air - %	74	75			
22. Oil Air - %	0	0			
23. Wood Air - %	73	75			
24. Wood Flow - 10^3 lb/h	70.0	75.0			
25. Oil Flow - 10^3 lb/h	0	0			
26. Oil Press. - psig	–	–			
27. Oil Temp - °F	–	–			
28. A.H. Gas In Temp. - °F	660	705			
29. A.H. Gas Out Temp. - °F	445	460			
30. A.H. Air In Temp. - °F	155	145			

Data Sheet 6002-1

UNIT OPERATING DATA

Page ~~Test~~ No. 2 of 2

Test No. ____ **Date** ____ **Location** 5 **Engr.** ____

Unit No. 10 **Fuel** ____ **Capacity** ____

Unit Type Hogged Fuel Power Boiler **Burner Type** ____

1. Test Number	5/2-1F	5/2-1F			
2. Date	10/1/79	10/1/79			
3. Time					
4. Load	160000	160000			
5. Process Rate					
6. A.H. Air out Temp - °F	500	525			
7. F.D. Fan out Press. - iwg	9.5	9.5			
8. A.H. in Press. - iwg	7.5	7.5			
9. A.H. out Press. - iwg	5.5	5.5			
10. Windbox - Left Press. - iwg	0.6	0.6			
11. Windbox - Right Press. - iwg	0.8	0.8			
12. Overfire Air - Left Press. - iwg	4.5	4.3			
13. Overfire Air - Right Press. - iwg	4.5	4.3			
14. Undergrate Windbox - Left Press. - iwg	3.9	3.5			
15. Undergrate Windbox - Rt. Press. - iwg	3.9	3.5			
16. Undergrate Rear Press. - iwg	1.0	0.6			
17. Undergrate 3rd Zone Press. - iwg	1.2	1.0			
18. Undergrate 2nd Zone Press. - iwg	1.3	1.1			
19. Undergrate Front Press. - iwg	0.4	0.1			
20. Scrubber ΔP - iwg	-13.0	-13.0			
21. Furnace Press. - iwg	-0.4	-0.8			
22. A.H. Gas out Press. - iwg	-9.0	-9.5			
23. Blr. out Press. - iwg	-5.6	-6.0			
24. Dust Coll. out Press. - iwg	-12.0	-12.5			
25. I.D. Fan out Press. - iwg	+17.0	+17.0			
26. Opacity - %	I.0.05	→			
27. Oxygen - %	6.0	6.3			
28. Combustibles - %	2.5	2.5			
29. OFA levels	4th	4th			
30. Comments	Baseline	Baseline			

BRINK →

Data Sheet 6002-1

UNIT OPERATING DATA

~~Sheet~~ Page No. 1 of 3

Test No. 5/2-4a Date 10/3/79 Location 5 Engr. Tidona

Unit No. 10 Fuel HOGGED WOOD Capacity 200,000 # STM/HR (Wood fuel only) 250,000 # STM/HR (Wood + No. 6 oil)

Unit Type HOGGED FUEL POWER BOILER Burner Type SPREADER STOKER

Low O_2 BASELINE BRINK PARTICULATE →

1. Test Number	5/2-1	5/2-4A	5/2-4A	5/2-4A	5/2-4A
2. Date	10/3/79	10/3/79	10/3/79	10/3/79	10/3/79
3. Time	11:57	14:16	15:17	16:37	17:46
4. Load	160000	160 000	160000	160000	160000
5. Process Rate					
6. 400# STM FLOW INTGR. (×100 = lb)	1747616	1747975	1748139	1748362	1748549
7. 125# STM FLOW INTGR. (×10 = lb)	8798292	8799426	8799760	8800109	8800455
8. WOOD FLOW INTGR. (×100 = lb)	6367972	6369435	6370096	6370913	6371592
9. OIL FLOW INTGR (×20 = lb)	1006136	1006136	1006136	1006136	1006136
10. 400# STM FLOW (from Intgr) - lb/h					
11. 125# STM FLOW (from Intgr) - lb/h					
12. TOT. STM FLOW - lb/h					160401
13. WOOD FLOW (from Intgr) - lb/h					62235
14. OIL FLOW (from Intgr) - lb/h					0
15. 400# STM FLOW - lb/h	160000	165000	165000	175000	170000
16. 125# STM FLOW - lb/h	6700	3400	2700	2500	3600
17. STM. HDR. PRESS. - psig	370	360	365	385	390
18. STM. PRESS. DESUPH OUT - psig	390	380	400	415	420
19. STM. TEMP. SUPH - °F	630	625	635	630	640
20. STM. TEMP. DESUPH - °F	605	600	600	600	605
21. TOT. COMB AIR - %	74	47	41	51	55
22. OIL AIR - %	0	0	0	0	0
23. WOOD AIR - %	73	47	39	51	54
24. WOOD FLOW - 10^3 lb/h	65.0	65.0	63.0	62.5	62.5
25. OIL FLOW - 10^3 lb/h	0	0	0	0	0
26. OIL PRESS. - psig	-	-	-	-	-
27. OIL TEMP - °F	-	-	-	-	-
28. A.H. GAS IN TEMP. - °F	690	670	665	690	695
29. A.H. GAS OUT TEMP. - °F	460	460	460	465	465
30. A.H. AIR IN TEMP. - °F	150	150	150	140	145

Data Sheet 6002-1

UNIT OPERATING DATA

~~Sheet~~ Page No. 2 of 3

Test No.______ Date______ Location 5 Engr.______

Unit No. 10 Fuel______ Capacity______

Unit Type HOGGED FUEL POWER BOILER Burner Type______

1. Test Number	5/2-1	5/2-4A	5/2-4A	5/2-4A	5/2-4A
2. Date	10/3/79	10/3/79	10/3/79	10/3/79	10/3/79
3. Time					
4. Load	160000	160000	160000	160000	160000
5. Process Rate					
6. A.H. AIR OUT TEMP - °F	530	530	535	540	545
7. F.D. FAN OUT PRESS. - iwg	9.5	3.5	2.7	4.5	5.0
8. A.H. IN PRESS. - iwg	8.0	3.0	2.5	3.8	4.5
9. A.H. OUT PRESS. - iwg	6.0	2.0	1.8	2.5	3.0
10. WINDBOX - LEFT PRESS. - iwg	1.0	0.0	0	0	0.1
11. WINDBOX - RIGHT PRESS. - iwg	1.1	0.0	0	0.1	0.3
12. OVERFIRE AIR - LEFT PRESS. - iwg	5.0	1.5	1.4	2.0	2.5
13. OVERFIRE AIR - RIGHT PRESS. - iwg	5.0	1.5	1.4	2.0	2.5
14. UNDERGRATE WINDBOX - LEFT PRESS. - iwg	4.0	0.8	0.6	1.5	1.7
15. UNDERGRATE WINDBOX - RT. PRESS. - iwg	4.0	1.0	0.6	1.5	1.7
16. UNDERGRATE REAR PRESS. - iwg	1.0	0.0	0	0.2	0.4
17. UNDERGRATE 3rd ZONE PRESS. - iwg	1.3	0.2	0.2	0.4	0.6
18. UNDERGRATE 2nd ZONE PRESS. - iwg	1.5	0.2	0.2	0.4	0.6
19. UNDERGRATE FRONT PRESS. - iwg	0.5	0.0	0	0	0.0
20. SCRUBBER ΔP - iwg	-13.7	-13.5	-11.7	-13.5	-13.6
21. FURNACE PRESS. - iwg	-0.2	-0.4	-0.4	-0.4	-0.4
22. A.H. GAS OUT PRESS. - iwg	-8.5	-5.7	-5.3	-6.5	-6.7
23. BLR. OUT PRESS. - iwg	-5.2	-35	-3.2	-4.0	-4.1
24. DUST COLL. OUT PRESS. - iwg	-11.3	-6.5	-6.0	-7.8	-7.8
25. I.D. FAN OUT PRESS. - iwg	+17.0	+18.0	+16.5	+19.5	+20.0
26. OPACITY - %	I.O.O.S.	—	—	—	→
27. OXYGEN - %	6.9	5.2	3.7	4.0	4.9
28. COMBUSTIBLES - %	—	—	—	—	—
29. OFA levels	4th	4th	4th	4th	4th
30. COMMENTS	BASELINE	LOW O_2	—	—	→

Data Sheet 6002-1

UNIT OPERATING DATA

Page No. 3 of 3

Test No. 5/2-1-4a Date ______ Location 5 Engr. ______

Unit No. 10 Fuel ______ Capacity ______

Unit Type HOGGED FUEL PWR. BLR. Burner Type SPREADER STOKER

5/2-1-

1. Test Number	5/2-1	5/2-4A	5/2-4A	5/2-4A	5/2-4A
2. Date	10/3/79	10/3/79	10/3/79	10/3/79	10/3/79
3. Time	12:02	14:25	15:23	15:43	17:54
4. Load	160000	160000	160000	160000	160000
5. Process Rate					
6. GRATE TEMPS - °F					
7. #1	510	530	540	550	540
8. #2	510	530	550	550	540
9. #3	610	680	660	660	620
10. #4	610	680	730	720	680
11. #5	790	950	900	900	760
12. #6	820	980	930	840	800
13. #7	640	620	680	620	660
14. #8	660	640	660	640	760
15. MULTICLONE ΔP - in.wg	-2.5	-0.8	-0.7	-1.1	-1.3
16. SCRUBBER OUT TEMP. °F	150	153	155	155	155
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.	BASELINE	LOW O_2	→	→	→

Data Sheet 6002-1

UNIT OPERATING DATA

Page No. 1 of 3

Test No. 5/3-1 Date 10/4/79 Location 5 Engr. TIDONA

Unit No. 10 Fuel HOGGED WOOD Capacity 200,000 # STM/HR (Wood fuel only) 250,000 # STM/HR (Wood + No. 6 oil)

Unit Type HOGGED FUEL POWER BOILER Burner Type SPREADER STOKER

LOAD VARIATIONS - GASEOUS EMISSIONS

1. Test Number	5/3-1	5/3-1	5/3-2	5/3-2a	5/3-3	5/3-3a
2. Date	10/4/79	10/4/79	10/4/72	10/4/72	10/	4/72
3. Time	10:23	10:52	13:13	14:07	15:07	15:43
4. Load	160000	160000	200000	200000	100	000
5. Process Rate						
6. 400# STM FLOW INTGR. (×100 = lb)	1751021	1751088	1751462	1751624	51758	51822
7. 125# STM FLOW INTGR. (×10 = lb)	8810356	8810612	8811896	8812570	13332	13800
8. WOOD FLOW INTGR. (×100 = lb)	6379030	6379235	6380548	6381135	81607	81831
9. OIL FLOW INTGR (×20 = lb)	1006137	1006137	1006137	1006137	637	637
10. 400# STM FLOW (from Intgr) - lb/h						
11. 125# STM FLOW (from Intgr) - lb/h						
12. TOT. STM FLOW - lb/h		138621		180000		106667
13. WOOD FLOW (from Intgr) - lb/h		42414		65222		37333
14. OIL FLOW (from Intgr) - lb/h		0		0		0
15. 400# STM FLOW - lb/h	150000	165000	190000	190000	105000	115000
16. 125# STM FLOW - lb/h	5500	5600	7800	8400	8000	6600
17. STM. HDR. PRESS. - psig	390	395	385	360	370	360
18. STM. PRESS. DESUPH OUT - psig	415	415	415	380	380	375
19. STM. TEMP. SUPH - °F	625	625	635	620	595	620
20. STM. TEMP. DESUPH - °F	600	600	600	600	585	600
21. TOT. COMB AIR - %	64	63	95	98	68	41
22. OIL AIR - %	0	0	0	0	0	0
23. WOOD AIR - %	62.5	62	94	98	67	40
24. WOOD FLOW - 10^3 lb/h	44.0	45.0	70.0	64.0	40.0	45.0
25. OIL FLOW - 10^3 lb/h	0	0	0	0	0	0
26. OIL PRESS. - psig	–	–	–	–	–	–
27. OIL TEMP - °F	–	–	–	–	–	–
28. A.H. GAS IN TEMP. - °F	710	720	770	760	635	630
29. A.H. GAS OUT TEMP. - °F	460	470	480	460	420	440
30. A.H. AIR IN TEMP. - °F	150	150	145	145	175	210

Data Sheet 6002-1

UNIT OPERATING DATA

Page ~~Test~~ No. 2 of 3

Test No.______ Date______ Location 5 Engr.______

Unit No. 10 Fuel______ Capacity______

Unit Type Hogged Fuel Power Boiler Burner Type______

1. Test Number	5/3-1	5/3-1	5/3-2	5/3-2a	5/3-3	5/3-3
2. Date	10/4/79	10/4/79	10/4/79	10/4/79	10/4/79	
3. Time						
4. Load	160000	160000	200000	200000	100000	
5. Process Rate						
6. A.H. Air out Temp - °F	540	540	530	510	485	510
7. F.D. Fan out Press. - iwg	6.8	6.5	17.5	18.5	8.0	3.0
8. A.H. In Press. - iwg	5.7	5.2	13.8	14.5	6.5	2.5
9. A.H. out Press. - iwg	4.0	3.8	10.5	11.0	4.8	1.5
10. Windbox - Left Press. - iwg	0.4	0.4	2.8	3.1	0.6	0.0
11. Windbox - Right Press. - iwg	0.6	0.6	3.0	3.3	0.8	0.0
12. Overfire Air - Left Press. - iwg	3.4	3.5	9.0	9.6	3.9	1.3
13. Overfire Air - Right Press. - iwg	3.4	3.5	9.0	9.6	3.9	1.3
14. Undergrate Windbox - Left Press. - iwg	2.6	2.6	7.6	8.0	3.1	0.6
15 Undergrate Windbox - RT. Press. - iwg	2.6	2.6	7.6	8.0	3.2	0.6
16. Undergrate Rear Press. - iwg	0.6	0.5	2.4	2.5	1.0	0.1
17. Undergrate 3rd Zone Press. - iwg	0.9	0.8	3.2	3.1	1.4	0.2
18. Undergrate 2nd Zone Press. - iwg	1.0	0.9	3.8	3.7	1.5	0.2
19. Undergrate Front Press. - iwg	0.1	0.1	2.1	2.0	0.6	0.0
20. Scrubber ΔP - iwg	-14.0	-14.0	-13.7	-13.5	-13.5	-11.7
21. Furnace Press. - iwg	-0.4	-0.4	+0.7	+0.8	-0.3	-0.4
22. A.H. Gas out Press. - iwg	-8.0	-8.0	-11.5	-11.5	-8.0	-5.2
23. Blr. out Press. - iwg	-5.2	-5.0	< -6.0	< -6.0	-5.1	-3.1
24. Dust Coll. out Press. - iwg	-10.0	-9.7	< -15.0	< -15.0	-10.0	-6.0
25. I.D. Fan out Press. - iwg	+21.0	+21.0	+17.0	+17.0	+17.0	+16.0
26. Opacity - %	5 0 O.S.	→				→
27. Oxygen - %	7.3	6.0	5.2	5.4	8.5	5.6
28. Combustibles - %	–	–	0.2	0.2	0.3	0.3
29. OFA levels	4th	4th	4th	4th	4th	4th
30. Comments	BASELINE	→	HIGH FIRE	→	LOW FIRE	→

Data Sheet 6002-1

UNIT OPERATING DATA

Page ~~Sheet~~ No. 3 of 3

Test No.______ Date______ Location 5 Engr.______

Unit No. 10 Fuel______ Capacity______

Unit Type HOGGED FUEL PWR. BLR. Burner Type SPREADER STOKER

5/3-1

1. Test Number		5/3-1	5/3-2	5/3-2a	5/3-3	5/3-3
2. Date	10/4/79	10/4/79	10/4/79	10/4/79	10/4/79	
3. Time	10:32	10:50	13:21	14:12	15:15	15:48
4. Load	160000	160000	200000	200000	100000	
5. Process Rate						
6. GRATE TEMPS - °F						
7. #1	520	530	510	520	460	480
8. #2	570	530	510	510	460	480
9. #3	590	610	560	550	500	560
10. #4	610	640	560	540	580	590
11. #5	820	740	780	740	690	660
12. #6	850	800	800	770	740	720
13. #7	720	680	540	530	540	810
14. #8	680	680	520	500	500	830
15. MULTICLONE ΔP - inwg	-1.5	-1.6	-3.5	-3.6	-2.0	-0.5
16. SCRUBBER OUT TEMP - °F	155	157	155	159	148	150
17.						
18.						
19.						
20.						
21.						
22.						
23.						
24.						
25.						
26.						
27.						
28.						
29.						
30.	BASELINE	→	HIGH FIRE	→	LOW FIRE	→

Data Sheet 6002-1

UNIT OPERATING DATA

~~Sheet~~ Page No. 1 of 3

Test No. 5/4-1 to 3 Date 10/1/79 Location 5 Engr. TIDONA

Unit No. 10 Fuel SAWDUST Capacity 200,000 # STM/HR (Wood fuel only)
250,000 # STM/HR (Wood + No. 6 oil)

Unit Type HOGGED FUEL POWER BOILER Burner Type SPREADER STOKER

OFA/UFA VARIATIONS

1. Test Number	5/4-1	5/4-2	5/4-3	5/4-4	
2. Date	10/1/79	10/1/79	10/1/79	10/1/79	
3. Time	13:20	14:59	16:04	16:30	
4. Load	160000	160000	160000	160000	
5. Process Rate					
6. 400# STM FLOW INTGR. (x1000=lb)	1740979	1741258	1741410	1741471	
7. 125# STM FLOW INTGR. (x10=lb)	8764915	8765956	8766634	8766870	
8. WOOD FLOW INTGR. (x100=lb)	6342323	6343494	6344257	6344535	
9. OIL FLOW INTGR (x20=lb)	1006134	1006134	1006134	1006134	
10. 400# STM FLOW (from Intgr) - lb/h					
11. 125# STM FLOW (from Intgr) - lb/h					
12. TOT. STM FLOW - lb/h				155368	
13. WOOD FLOW (from Intgr) - lb/h				69853	
14. OIL FLOW (from Intgr) - lb/h				0	
15. 400# STM FLOW - lb/h	175 000	150000	155000	150000	
16. 125# STM FLOW - lb/h	6100	5600	6500	5400	
17. STM. HDR. PRESS. - psig	365	365	390	385	
18. STM. PRESS., DESUPH OUT - psig	390	385	420	410	
19. STM. TEMP. SUPH - °F	615	595	635	615	
20. STM. TEMP., DESUPH - °F	600	580	605	600	
21. TOT. COMB AIR - %	64	58	58	54	
22. OIL AIR - %	0	0	0	0	
23. WOOD AIR - %	64	58	58	53	
24. WOOD FLOW - 10^3 lb/h	64.0	65.0	77.0	71.5	
25. OIL FLOW - 10^3 lb/h	0	0	0	0	
26. OIL PRESS. - psig	-	-	-	-	
27. OIL TEMP - °F	-	-	-	-	
28. A.H. GAS IN TEMP. - °F	700	660	690	665	
29. A.H. GAS OUT TEMP. - °F	465	440	455	445	
30. A.H. AIR IN TEMP. - °F	155	160	175	165	

Data Sheet 6002-1

UNIT OPERATING DATA

Page ~~Sheet~~ No. 2 of 3

Test No.________ Date________ Location 5 Engr.________

Unit No. 10 Fuel________ Capacity________

Unit Type Hogged Fuel Power Boiler Burner Type________

1. Test Number	5/4-1	5/4-2	5/4-3	5/4-4	
2. Date	10/1/79	10/1/79	10/1/79	10/1/79	
3. Time					
4. Load	160000	160000	160000	160000	
5. Process Rate					
6. A.H. AIR OUT TEMP - °F	530	510	520	510	
7. F.D. FAN OUT PRESS. - iwg	7.5	7.5	7.0	6.6	
8. A.H. IN PRESS. - iwg	6.5	6.5	6.0	5.0	
9. A.H. OUT PRESS. - iwg	5.0	4.5	5.0	4.0	
10. WINDBOX - LEFT PRESS. - iwg	0.5	0.6	0.9	0.6	
11. WINDBOX - RIGHT PRESS. - iwg	0.7	0.8	1.1	0.8	
12. OVERFIRE AIR - LEFT PRESS. - iwg	4.0	3.2	4.0	3.2	
13. OVERFIRE AIR - RIGHT PRESS. - iwg	4.0	3.2	4.0	3.2	
14. UNDERGRATE WINDBOX - LEFT PRESS. - iwg	3.3	3.0	3.0	2.5	
15. UNDERGRATE WINDBOX - RT. PRESS. - iwg	3.3	3.2	3.0	2.5	
16. UNDERGRATE REAR PRESS. - iwg	0.9	0.5	0.5	0.8	
17. UNDERGRATE 3rd ZONE PRESS. - iwg	1.2	1.0	1.0	1.0	
18. UNDERGRATE 2nd ZONE PRESS. - iwg	1.3	1.1	1.0	1.1	
19. UNDERGRATE FRONT PRESS. - iwg	0.3	0.0	0.0	0.1	
20. SCRUBBER ΔP - iwg	-12.7	-12.7	-13.8	-13.0	
21. FURNACE PRESS. - iwg	+0.3	-0.5	-0.5	-0.8	
22. A.H. GAS OUT PRESS. - iwg	-7.0	-5.5	-5.7	-5.8	
23. BLR. OUT PRESS. - iwg	-4.3	-3.0	-3.8	-2.8	
24. DUST COLL. OUT PRESS. - iwg	-9.0	-7.5	-7.7	-6.7	
25. I.D. FAN OUT PRESS. - iwg	+16.0	+19.0	+19.0	+18.0	
26. OPACITY - %	I.0.0.S.	→	→	→	
27. OXYGEN - %	5.2	6.5	6.0	6.1	
28. COMBUSTIBLES - %	2.5	2.5	2.5	2.5	
29. OFA levels	4th	3rd + 4th	NONE	4th	
30. COMMENTS	BASELINE	HIGH OFA	ZERO OFA	REPEAT BASELINE	

Data Sheet 6002-1

UNIT OPERATING DATA

Page ~~Test~~ No. 3 of 3

Test No. 5/4-1 to 3 Date 10/1/79 Location 5 Engr. TIDONA

Unit No. 10 Fuel HOGGED Capacity

Unit Type HOGGED FUEL PWR. BLR. Burner Type SPREADER STOKER

1. Test Number	5/4-1	5/4-2	5/4-3	5/4-4	
2. Date	10/1/79	10/1/79	10/1/79	10/1/79	
3. Time	13:31	15:14	16:11	16:37	
4. Load	160000	160000	160000	160000	
5. Process Rate					
6. GRATE TEMPS. - °F					
7. #1	510	520	510	510	
8. #2	540	570	500	520	
9. #3	550	690	600	580	
10. #4	680	680	620	640	
11. #5	770	1160	950	980	
12. #6	810	1180	980	1020	
13. #7	630	890	800	820	
14. #8	570	940	840	880	
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.	BASELINE	HIGH OFA	ZERO OFA	BASELINE	
26.					
27.					
28.					
29.					
30.					

Data Sheet 6002-1

UNIT OPERATING DATA

Page No. 1 of 3

Test No. 5/4-2A Date 10/2/79 Location 5 Engr. TIDONA

Unit No. 10 Fuel HOGGED Capacity 200,000 # STM/HR (Wood fuel only)
250,000 # STM/HR (Wood + No. 6 oil)

Unit Type HOGGED FUEL POWER BOILER Burner Type SPREADER STOKER

OPTIMUM OFA PARTICULATES

1. Test Number	5/4-2A	5/4-2A	5/4-2A	5/4-2A	
2. Date	10/2/79	10/2/79	10/2/79	10/2/79	
3. Time	11:34	13:00	14:14	15:51	
4. Load	160000	160000	160000	160000	
5. Process Rate					
6. 400# STM FLOW INTGR. (x100=lb)	1744187	1744401	1744590	1744839	
7. 125# STM FLOW INTGR. (x10=lb)	8779534	8780547	8781426	8782536	
8. WOOD FLOW INTGR. (x100=lb)	6355589	6356282	6356922	6357727	
9. OIL FLOW INTGR (x20=lb)	1006135	1006135	1006135	1006135	
10. 400# STM FLOW (from Intgr) - lb/h					
11. 125# STM FLOW (from Intgr) - lb/h					
12. TOT. STM FLOW - lb/h				152218	
13. WOOD FLOW (from Intgr) - lb/h				49914	
14. OIL FLOW (from Intgr) - lb/h				0	
15. 400# STM FLOW - lb/h	150000	155000	170000	150000	
16. 125# STM FLOW - lb/h	7200	7800	6700	7200	
17. STM. HDR. PRESS. - psig	390	390	380	360	
18. STM. PRESS. DESUPH OUT - psig	420	415	410	380	
19. STM. TEMP. SUPH - °F	635	625	615	600	
20. STM. TEMP. DESUPH - °F	600	600	600	590	
21. TOT. COMB AIR - %	59	70	71	69	
22. OIL AIR - %	0	0	0	0	
23. WOOD AIR - %	59	69	69	68	
24. WOOD FLOW - 10^3 lb/h	45.0	53.5	54.0	52.0	
25. OIL FLOW - 10^3 lb/h	0	0	0	0	
26. OIL PRESS. - psig	-	-	-	-	
27. OIL TEMP - °F	-	-	-	-	
28. A.H. GAS IN TEMP. - °F	660	690	695	690	
29. A.H. GAS OUT TEMP. - °F	445	450	460	460	
30. A.H. AIR IN TEMP. - °F	175	165	155	160	

Data Sheet 6002-1

Page ~~Test~~ No. 2 of 3

UNIT OPERATING DATA

Test No.______ Date______ Location 5 ______ Engr.______

Unit No. 10 Fuel______ Capacity______

Unit Type Hogged Fuel Power Boiler Burner Type______

1. Test Number	5/4-2A	5/4-2A	5/4-2A	5/4-2A	
2. Date	10/2/79	10/2/79	10/2/79	10/2/79	
3. Time					
4. Load	160000	160000	160000	160,000	
5. Process Rate					
6. A.H. Air out Temp - °F	510	510	520	520	
7. F.D. Fan out Press. - iwg	5.0	7.5	7.5	7.0	
8. A.H. in Press. - iwg	4.0	6.0	6.0	6.0	
9. A.H. out Press. - iwg	3.0	4.0	4.0	4.0	
10. Windbox - Left Press. - iwg	0.1	0.3	0.2	0.4	
11. Windbox - Right Press. - iwg	0.2	0.5	0.4	0.7	
12. Overfire Air - Left Press. - iwg	2.9	3.7	3.7	3.6	
13. Overfire Air - Right Press. - iwg	2.9	3.7	3.7	3.6	
14. Undergrate Windbox - Left Press. iwg	2.8	2.7	2.9	2.6	
15 Undergrate Windbox - Rt. Press. - iwg	2.8	2.7	2.9	2.6	
16. Undergrate Rear Press. - iwg	0.2	0.6	0.6	0.6	
17. Undergrate 3rd Zone Press. - iwg	0.4	0.9	1.0	1.0	
18. Undergrate 2nd Zone Press. - iwg	0.4	1.0	1.1	1.1	
19. Undergrate Front Press. - iwg	0.0	0.2	0.1	0.1	
20. Scrubber ΔP - iwg	-13.9	-14.0	-13.9	-13.9	
21. Furnace Press. - iwg	-0.4	-0.6	-0.4	-0.4	
22. A.H. Gas out Press. - iwg	-6.7	-8.7	-8.5	-8.2	
23. Blr. out Press. - iwg	-4.1	-5.2	-5.1	-5.0	
24. Dust Coll. out Press. - iwg	-8.6	-11.0	-10.7	-10.5	
25. I.D. Fan out Press. - iwg	+20.0	+17.5	+17.0	+17.0	
26. Opacity - %	I.O.O.S.	→	→	→	
27. Oxygen - %	6.1	6.8	6.2	6.4	
28. Combustibles - %	—	—	—	—	
29. OFA levels	3rd, 4th	→	→	→	
30. Comments	OPT. OFA	→	→	→	

Data Sheet 6002-1

Page ~~Sheet~~ No. 3 of 3

UNIT OPERATING DATA

Test No. 5/4-2A Date 10/2/79 Location 5 Engr.

Unit No. 10 Fuel Capacity

Unit Type HOGGED FUEL PWR. BLR. Burner Type SPREADER STOKER

1. Test Number	5/4-2A	5/4-2A	5/4-2A	5/4-2A	
2. Date	10/2/79	10/2/79	10/2/79	10/2/79	
3. Time		13:08	14:19	16:04	
4. Load	160000	160000	160000	160000	
5. Process Rate					
6. GRATE TEMPS - °F					
7. #1	520	510	510	520	
8. #2	530	510	520	520	
9. #3	580	600	600	620	
10. #4	690	640	650	660	
11. #5	800	880	875	860	
12. #6	860	910	920	900	
13. #7	660	540	580	570	
14. #8	660	520	520	530	
15. MULTICLONE ΔP-iwg	-1.5	-2.5	-2.5	-2.5	
16. SCRUBBER OUTLET TEMP - °F	140	138	142	144	
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.	OPT. OFA	OPT. OFA		→	

Data Sheet 6002-1

UNIT OPERATING DATA

Run No. 1 of 3

Test No. ____ Date 10·16·79 Location 5 Engr. B.

Unit No. 10 Fuel Wood Capacity 200,000 # STM/HR (Wood fuel only) 250,000 # STM/HR (Wood + No 6 oil)

Unit Type Hogged Fuel Power Boiler Burner Type Spreader Stoker

1. Test Number	5/1-1	5/5-2	5/5-2	5/5-3	5/5-1
2. Date	10·16·79	10·16·79	10·16·79	10·16·79	10·16·79
3. Time	13:20	14:25	15:10"	15:45	-
4. Load	155	160	150	145	160
5. Process Rate					
6. 400# STM FLOW INTGR (×1000 = lb)	1797388	1797548	1797655	1707741	1797833
7. 125# STM FLOW INTGR (×100 = lb)	9035156	9036070	9036677	9037084	9037514
8. WOOD FLOW INTGR (×100 = lb)	6511790	6512377	6512781	6513100	6513441
9. OIL FLOW INTGR (×20 = lb)	1048311	1048311	same	same	same
10. 400# STM FLOW (from Intgr) - lb/h	-			tot. stm flow	144,321
11. 125# STM FLOW (from Intgr) - lb/h	-				
12. TOT STM FLOW - lb/h	155,000	160,000	150,000	145,000	160,000
13. WOOD FLOW (from Intgr) - lb/h	-				
14. OIL FLOW (from Intgr) - lb/h	-				0
15. 400# STM FLOW - lb/h					
16. 125# STM FLOW - lb/h					
17. STM HDR PRESS. - psig	380	380	380		360
18. STM PRESS, DESUPH OUT - psig	410	410	410	405	380
19. STM TEMP SUPH - °F	640	640	640	640	630
20. STM TEMP DESUPH - °F	605	605	605	665	600
21. TOT COMB AIR - %	62	65	58	59	63
22. OIL AIR - %	0	13	14	14	0
23. WOOD AIR - %	61	53	47	48	62
24. WOOD FLOW - 10³ lb/h	55	56	55	55	56
25. OIL FLOW - 10³ lb/h	0	0	0	0	0
26. OIL PRESS. - psig	-	-	-	-	-
27. OIL TEMP - °F	-	-	-	-	-
28. A.H. GAS IN TEMP - °F	630	640	630	680	630
29. A.H. GAS OUT TEMP - °F	425	430	435	410	430
30. A.H. AIR IN TEMP - °F	190	185	180	175	175

Baseline As Found

Aux. Air Damper "AA" Adj.

Aux. Air and Low O₂

Oil O.F. Air "C" Adj.

Baseline

UNIT OPERATING DATA

~~Test~~ Page No. 2 of 3

Test No.______ Date 10-16-79 Location 5 Engr. [illegible]

Unit No. 10 Fuel______ Capacity______

Unit Type HOGGED FUEL POWER BOILER Burner Type______

1. Test Number					
2. Date	10-16-79	→	→	→	→
3. Time	13:25	14:25	15:10	15:45	16:25
4. Load					
5. Process Rate					
6. A.H. AIR OUT TEMP - °F	490	490	500	495	492
7. F.D. FAN OUT PRESS. - iwg	6.0	7.0	5.5	5.0	5.3
8. A.H. IN PRESS. - iwg	5.0	6.0	4.1	4.1	5.0
9. A.H. OUT PRESS. - iwg	3.5	4.0	3.0	3.0	4.0
10. WINDBOX - LEFT PRESS. - iwg	0	1.6	1.0	1.2	0
11. WINDBOX - RIGHT PRESS. - iwg	0	1.8	1.2	1.4	0
12. OVERFIRE AIR - LEFT PRESS. - iwg	2.9	3.5	2.6	2.5	3.0
13. OVERFIRE AIR - RIGHT PRESS. - iwg	2.9	3.5	2.5	2.5	3.0
14. UNDERGRATE WINDBOX - LEFT PRESS. - iwg	2.4	3.0	2.0	2.0	2.4
15. UNDERGRATE WINDBOX - RT. PRESS. - iwg	2.0	2.4	1.5	1.5	2.0
16. UNDERGRATE REAR PRESS. - iwg	.6	.8	.5	.5	.6
17. UNDERGRATE 3rd ZONE PRESS. - iwg	.8	1.0	.8	.8	.8
18. UNDERGRATE 2nd ZONE PRESS. - iwg	.8	1.2	1.0	.8	1.0
19. UNDERGRATE FRONT PRESS. - iwg	.1	.1	.1	.1	.1
20. Sc~~RUBBER~~ Multicl. ΔP - iwg	3.1	4.0	+ 1.5	1.5	4.5
21. FURNACE PRESS. - iwg	-.5	-.5	-.5	-.5	-.5
22. A.H. GAS OUT PRESS. - iwg	-5.0	-5.5	-5.0	-4.5	-5.0
23. BLR. OUT PRESS. - iwg	-2.8	-3.0	-2.5	-2.3	-2.6
24. DUST COLL. OUT PRESS. - iwg	-7.0	-7.5	-6.2	-6.0	-7.3
25. I.D. FAN OUT PRESS. - iwg	-20	-20	-20	-20	-20
26. OPACITY - %	-	-	-	-	-
27. OXYGEN - %	7.0	7.0	6.5	6.0	6.5
28. COMBUSTIBLES - %	.15	.2	.2	.15	.15
29. Aux. Air damper AA	0% open	10% open	10% open	O.Fire "C" 13% open	0% open
30. COMMENTS					

Data Sheet 6002-1

UNIT OPERATING DATA

~~Sheet~~ Page No. 3 of 3

Test No.____ Date____ Location 5 Engr. K.

Unit No. 10 Fuel____ Capacity____

Unit Type HOGGED FUEL PWR. BLR. Burner Type SPREADER STOKER

1. Test Number					
2. Date	10-16-79				→
3. Time	13:25	14:25	15:10	15:45	16:25
4. Load					
5. Process Rate					
6. GRATE TEMPS - °F					
7. #1	470	460	485	486	470
8. #2	470	460	485	475	470
9. #3	520	540	580	545	525
10. #4	575	585	645	600	595
11. #5	735	800	800	780	800
12. #6	815	835	840	820	835
13. #7	585	555	625	575	610
14. #8	560	545	640	540	580
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

Data Sheet 6002-1

UNIT OPERATING DATA

~~Sheet~~ Run No. 2 of 3

Test No.________ Date 10-15-79 Location 5 Engr.

Unit No. 10 Fuel [illegible] Capacity 200,000 # STM/HR (Wood fuel only) 250,000 # STM/HR (Wood + No 6 oil)

Unit Type HOGGED FUEL POWER BOILER Burner Type SPREADER STOKER

1. Test Number	5/6-1	5/6-1	5/6-2	5/6-2	
2. Date	10-15-79				
3. Time	10:15	10:45	12:00	12:35	
4. Load	-	-	-	-	
5. Process Rate	-	-	-	-	
6. 400# STM FLOW INTGR (×1000 lb)	1792498	1792602	1792843	1792952	
7. 125# STM FLOW INTGR (×100 lb)	9010558	9011017	9011227	9011227	
8. WOOD FLOW INTGR (×100 lb)	6595977	6496304	6497043	6497406	
9. OIL FLOW INTGR (×20 lb)	1044678	1044733	1044865	1044924	
10. 400# STM FLOW (from Intgr) - lb/h					
11. 125# STM FLOW (from Intgr) - lb/h					
12. TOT STM FLOW - lb/h	200,000	210,000	219,000	189,000	
13. WOOD FLOW (from Intgr) - lb/h		65400		57086	
14. OIL FLOW (from Intgr) - lb/h		2800		2023	
15. 400# STM FLOW - lb/h	-	208,000	-	186857	
16. 125# STM FLOW - lb/h	-	-	-	-	
17. STM HDR PRESS. - psig	370	370	370	370	
18. STM PRESS, DESUPHOUT - psig	390	390	390	390	
19. STM TEMP SUPH - °F	620	615	615	615	
20. STM TEMP DESUPH - °F	595	590	590	590	
21. TOT. COMB AIR - %	76	89	69	72	
22. OIL AIR - %	18	22	19	19	
23. WOOD AIR - %	61	73	55	59	
24. WOOD FLOW - 10^3 lb/h	67	77	59	63	
25. OIL FLOW - 10^3 lb/h	1.4	1.4	1.4	1.4	
26. OIL PRESS. - psig	60	60	60	60	
27. OIL TEMP - °F	200	200	200	200	
28. A.H. GAS IN TEMP - °F	680	700	675	665	
29. A.H. GAS OUT TEMP - °F	452	455	410	400	
30. A.H. AIR IN TEMP. - °F	150	152	62	65	
	Base-line	Base-line	Low Comb. air Temp.	Low Comb. Air Temp.	

Data Sheet 6002-1

UNIT OPERATING DATA

Page No. 2 of 3

Test No. ____ Date 10-15-79 Location 5 Engr. ____

Unit No. 10 Fuel Wood & oil Capacity ____

Unit Type Hogged Fuel Power Boiler Burner Type ____

1. Test Number					
2. Date	10-15-79	10-15-79	10-15-79	10-15-79	
3. Time	10:15	10:45	12:00	12:35	
4. Load					
5. Process Rate					
6. A.H. Air out Temp - °F	519	515	480	475	
7. F.D. Fan out Press. - iwg	9.2	12	9.1	10.5	
8. A.H. in Press. - iwg	7.9	9.0	7.5	8.5	
9. A.H. out Press. - iwg	6.0	6.0	5.3	5.5	
10. Windbox - Left Press - iwg	1.8	1.0	1.0	1.1	
11. Windbox - Right Press. - iwg	2.0	1.2	1.2	1.4	
12. Overfire Air - Left Press. - iwg	5.1	5.0	4.1	4.6	
13. Overfire Air - Right Press. - iwg	5.1	5.2	4.1	4.5	
14. Undergrate Windbox - Left Press. - iwg	4.6	4.5	2.0	4.0	
15. Undergrate Windbox - Rt. Press. - iwg	4.2	4.00	1.8	3.1	
16. Undergrate Rear Press. - iwg	1.5	1.1	.5	.8	
17. Undergrate 3rd Zone Press. - iwg	1.8	1.6	1.0	1.1	
18. Undergrate 2nd Zone Press. - iwg	2.0	1.8	1.2	1.5	
19. Undergrate Front Press. - iwg	1.0	.5	0	.5	
20. ~~Scrubber~~ Multiclone ΔP - iwg	+3.0	3.5	2.5	3.0	
21. Furnace Press. - iwg	-.3	-.7	-1.3	-1.5	
22. A.H. Gas out Press. - iwg	-7.0	-8.0	-7.2	-7.7	
23. Blr. out Press. - iwg	-3.5	-4.5	-3.5	-4.3	
24. Dust Coll. out Press. - iwg	-11.0	-11.5	-9.5	-11.0	
25. I.D. Fan out Press. - iwg	-17.0	-12.0	-16.0	-16.0	
26. Opacity - %	-	-	-	-	
27. Oxygen - %	5.0	5.0	5.2	4.5	
28. Combustibles - %	0.2	.3	.3	.3	
29. OF Air Level No.	4	4	4	4	
30. Comments	#4 Oil Gun Min. Flow	same	same	same	

Baseline

Baseline

Low Comb. Air Temp.

Low Comb. Air Temp.

Data Sheet 6002-1

UNIT OPERATING DATA

Page No. 3 of 3

Test No. ________ Date 10-15-79 Location 5 Engr.

Unit No. 10 Fuel [illegible] Capacity ________

Unit Type HOGGED FUEL PWR. BLR. Burner Type SPREADER STOKER

1. Test Number					
2. Date	10-15-79	→			
3. Time	10:15	10:45	12:00	12:35	
4. Load					
5. Process Rate					
6. GRATE TEMPS - °F					
7. #1	482	480	460	475	
8. #2	490	485	460	475	
9. #3	545	530	550	525	
10. #4	580	585	565	550	
11. #5	860	800	755	800	
12. #6	905	820	760	805	
13. #7	610	610	555	500	
14. #8	540	525	510	520	
15. Cold End Temp. °F	300	300	230	225	
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					
	Baseline	Baseline	Low Comb. Air Temp.	Low Comb. Air Temp.	

Data Sheet 6002-1

UNIT OPERATING DATA

Page No. 1 of 2

Test No.________ Date 10-15-79 Location 5 Engr.

Unit No. 10 Fuel Wood Capacity 200,000 # STM/HR (Wood fuel only) 250,000 # STM/HR (Wood + No 6 oil)

Unit Type HOGGED FUEL POWER BOILER Burner Type SPREADER STOKER

1. Test Number	5/6-2a	5/6-2a	5/6-2a	5/6-1a	
2. Date	10-15-79	⟶			
3. Time	13:15	13:45	14:15	14:45	
4. Load					
5. Process Rate					
6. 400# STM FLOW INTGR (×1000 = lb)	17903061	1793146	1793219	1793300	
7. 125# STM FLOW INTGR (×10 = lb)	9011227	9011227	9011538	9012050	
8. WOOD FLOW INTGR (×100 = lb)	6497788	6498095	6498567		
9. OIL FLOW INTGR (×20 = lb)	1044954	1044954	1044954	—	
10. 400# STM FLOW (from Intgr) - lb/h	-	170,000		162,000	
11. 125# STM FLOW (from Intgr) - lb/h	-				
12 TOT STM FLOW - lb/h	165,000	165,000	165,000	170,000	
13. WOOD FLOW (from Intgr) - lb/h	-				
14. OIL FLOW (from Intgr) - lb/h	-				
15. 400# STM FLOW - lb/h	-	170,000		162,000	
16. 125# STM FLOW - lb/h	-				
17. STM HDR PRESS. - psig	390	398	340	340	
18. STM PRESS. DESUPH OUT - psig	4.5	415	355	360	
19. STM TEMP SUPH - °F	630	630	600	640	
20. STM. TEMP. DESUPH - °F	600	600	580	600	
21. TOT. COMB AIR - %	60	60	62	62	
22. OIL AIR - %	0	0	0	0	
23. WOOD AIR - %	60	60	62	62	
24. WOOD FLOW - 10³ lb/h	60	61.5	62.5	62.5	
25. OIL FLOW - 10³ lb/h	0	0	0		
26. OIL PRESS. - psig	-	-	-	-	
27. OIL TEMP - °F	-	-	-	-	
28. A.H. GAS IN TEMP - °F	655	640	630	640	
29. A.H. GAS OUT TEMP - °F	395	372	440	440	
30. A.H. AIR IN TEMP - °F	62	62	200	200	
	Low Comb. Air Preheat	Low Comb. Air Preheat	Baseline	Baseline	

Data Sheet 6002-1

UNIT OPERATING DATA

Page No. 2 of 3

Test No. Date 10·15·79 Location 5 Engr.

Unit No. 10 Fuel Wood Capacity

Unit Type HOGGED FUEL POWER BOILER Burner Type

1. Test Number	5/6-2a	2/6-2a	5/6-2a	5/6-29	
2. Date	10·15·79	→	→	→	
3. Time	13:15	13:45	14:15	14:45	
4. Load					
5. Process Rate					
6. A.H. AIR OUT TEMP - °F	470	467	490	500	
7. F.D. FAN OUT PRESS. - iwg	6.0	5.5	6.0	6.0	
8. A.H. IN PRESS. - iwg	5.0	5.0	5.0	5.0	
9. A.H. OUT PRESS. - iwg	3.5	3.5	3.8	3.5	
10. WINDBOX - LEFT PRESS. - iwg	0	0	0	0	
11. WINDBOX - RIGHT PRESS. - iwg	0	0	0	0	
12. OVERFIRE AIR - LEFT PRESS. - iwg	3.0	3.0	3.0	3.0	
13. OVERFIRE AIR - RIGHT PRESS. - iwg	3.0	3.0	3.0	3.0	
14. UNDERGRATE WINDBOX - LEFT PRESS. - iwg	2.4	2.3	2.5	2.4	
15. UNDERGRATE WINDBOX - RT. PRESS. - iwg	2.0	2.0	2.0	1.8	
16. UNDERGRATE REAR PRESS. - iwg	.8	.6	.5	.5	
17. UNDERGRATE 3rd ZONE PRESS - iwg	1.0	1.0	1.0	.8	
18. UNDERGRATE 2nd ZONE PRESS. - iwg	0.8	1.0	1.0	.9	
19. UNDERGRATE FRONT PRESS. - iwg	0	.2	.2	.2	
20. ~~SCRUBBER~~ Multicl. ΔP - iwg	1.5	1.5	1.5	1.5	
21. FURNACE PRESS. - iwg	-.5	-.6	-.3	-.3	
22. A.H. GAS OUT PRESS. - iwg	-5.5	-5.0	-5.0	-5.0	
23. BLR. OUT PRESS. - iwg	-3.0	-2.7	-2.7	-3.0	
24. DUST COLL. OUT PRESS. - iwg	-7.0	-6.5	-6.5	-6.5	
25. I.D. FAN OUT PRESS. - iwg	-20	-20	-20	-20	
26. OPACITY - %	-	-	-	-	
27. OXYGEN - %	5.5	5.5	6.2	6.4	
28. COMBUSTIBLES - %	.2	.2	.2	.4	
29. OFA level No.	4	4	4	4	
30. COMMENTS					

Data Sheet 6002-1

UNIT OPERATING DATA

Page ~~Sheet~~ No. 3 of 3

Test No.________ Date 10·15·79 Location 5 Engr. K.

Unit No. 10 Fuel Wood. Capacity________

Unit Type HOGGED FUEL PWR. BLR. Burner Type SPREADER STOKER

1. Test Number	5/6-2a	5/6-2a	5/6·10	5/6·10	
2. Date	10-15-79	——	——	→	
3. Time	13:15	13:45	14:15	14:45	
4. Load					
5. Process Rate					
6. GRATE TEMPS - °F					
7. #1	445	445	465	460	
8. #2	455	465	470	480	
9. #3	505	530	540	540	
10. #4	580	600	600	600	
11. #5	740	740	860	820	
12. #6	800	800	880	880	
13. #7	580	585	600	590	
14. #8	585	580	545	560	
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

Data Sheet 6002-1

UNIT OPERATING DATA

Run No. 1 of 3

Test No.____________ Date__________ Location 5 Engr. KS

Unit No. 10 Fuel Wood Capacity 200,000 # STM/HR (wood fuel only)
250,000 # STM/HR (wood + No 6 oil)

Unit Type HOGGED FUEL POWER BOILER Burner Type SPREADER STOKER

1. Test Number	5/7-1	5/7-2	5/7-2	5/7-3	5/7-2
2. Date	10-17-79				
3. Time	9:25	10:15	12:15		
4. Load	—	—	—		
5. Process Rate	155	155	145		162
6. 400# STM FLOW INTGR (×1000 = lb)	1800580	1800703	1800990		
7. 125# STM FLOW INTGR (×10³ lb)	9052254	9052903	9054330		
8. WOOD FLOW INTGR (×1000 lb)	6522717	6523126	6524042		
9. OIL FLOW INTGR (×20 = lb)	1048890	1048891	1048890		
10. 400# STM FLOW (from intgr) - lb/h	—	—	—		
11. 125# STM FLOW (from intgr) - lb/h	—	—	—		
12. TOT STM FLOW - lb/h	155,000	155,000	145,000		
13. WOOD FLOW (from intgr) - lb/h	—		—		
14. OIL FLOW (from intgr) - lb/h	—		—		
15. 400# STM FLOW - lb/h	—		—		
16. 125# STM FLOW - lb/h	—				
17. STM HDR PRESS. - psig	382	370	375		
18. STM PRESS DESUPERHEAT OUT - psig	410	390	400		
19. STM TEMP SUPH - °F	640	640	625		
20. STM TEMP DESUPH - °F	605	605	600		
21. TOT. COMB AIR - %	64	57	58		56
22. OIL AIR - %	0	15	17		
23. WOOD AIR - %	63	48	47	43	43
24. WOOD FLOW - 10³ lb/h	51	47	47.5	53	55
25. OIL FLOW - 10³ lb/h	0	0	0	0	0
26. OIL PRESS. - psig	0	0	0	0	0
27. OIL TEMP - °F	—	—	—	—	—
28. A.H. GAS IN TEMP - °F	645	635	640		
29. A.H. GAS OUT TEMP - °F	440	435	440		
30. A.H. AIR IN TEMP - °F	170	175	175		
	Baseline	Low NOx Partic. Brink	Low NOx Partic. Brink	Low NOx	Low NOx

UNIT OPERATING DATA

Page No. 2 of 3

Test No.______ Date______ Location 5 Engr.______

Unit No. 10 Fuel______ Capacity______

Unit Type Hogged Fuel Power Boiler Burner Type______

1. Test Number	5/7-1	5/7-2	5/7-2	5/7-2	5/7-2
2. Date	10-17-79	10-17-79	10-17-79	10-17-79	10-17-79
3. Time	9:25	10:15	12:15	13:15	14:40
4. Load	155	155	145	155	162
5. Process Rate	–	–	–	–	
6. A.H. AIR OUT TEMP - °F	505	505	510	515	520
7. F.D. FAN OUT PRESS. - iwg	6.5	6.0	5.2	4.9	5.0
8. A.H. IN PRESS. - iwg	5.8	4.9	4.5	4.0	4.0
9. A.H. OUT PRESS. - iwg	4.0	3.5	3.2	2.5	2.9
10. WINDBOX - LEFT PRESS. - iwg	0	1.5	1.2	1.0	1.1
11. WINDBOX - RIGHT PRESS. - iwg	0	1.5	1.4	1.2	1.3
12. OVERFIRE AIR - LEFT PRESS. - iwg	3.1	3.0	2.7	2.3	2.4
13. OVERFIRE AIR - RIGHT PRESS. - iwg	3.1	3.1	2.7	2.2	2.4
14. UNDERGRATE WINDBOX - LEFT PRESS. iwg	2.5	2.0	2.0	1.8	1.8
15 UNDERGRATE WINDBOX - RT. PRESS. - iwg	2.0	1.8	1.6	1.4	1.5
16. UNDERGRATE REAR PRESS. - iwg	.5	.7	.5	.5	.6
17. UNDERGRATE 3rd ZONE PRESS. - iwg	.8	1.0	.6	.6	.7
18. UNDERGRATE 2nd ZONE PRESS. - iwg	.8	1.0	.7	.6	.7
19. UNDERGRATE FRONT PRESS. - iwg	.1	.1	0	0	.1
20. ~~SCRUBBER~~ Multicl ΔP - iwg	+2.0	1.5	+1.5	1.3	1.5
21. FURNACE PRESS. - iwg	-.3	-.3	-.4	-5	-.7
22. A.H. GAS OUT PRESS. - iwg	-6.0	-5.5	-5	-5	-5
23. BLR. OUT PRESS. - iwg	-3.0	2.5	-2.5	-2.5	-2.2
24. DUST COLL. OUT PRESS. - iwg	-7.5	-6.5	-6.5	-6.0	-6.0
25. I.D. FAN OUT PRESS. - iwg	-20	-20	-20	-20	-20
26. OPACITY - %	–	–	–		
27. OXYGEN - %	6.5	5.0	6.4	5.3	5.2
28. COMBUSTIBLES - %	.2	.25	.2	.3	.2
29. Aux Air "AA" % open	0	10	10	10	10
30. COMMENTS					

Data Sheet 6002-1

UNIT OPERATING DATA

Page ~~Sheet~~ No. 3 of 3

Test No.________ Date________ Location 5 Engr.________

Unit No. 10 Fuel Wood. Capacity________

Unit Type HOGGED FUEL PWR. BLR. Burner Type SPREADER STOKER

1. Test Number	517-1	5/7-2	5/7-2	5/7-2	5/7-2
2. Date	10-17-79				→
3. Time	9:25	10:15	12:15	13:15	14:40
4. Load					
5. Process Rate					
6. GRATE TEMPS - °F					
7. #1	500	480	480	500	500
8. #2	585	500	480	510	500
9. #3	545	565	545	590	600
10. #4	565	650	580	630	600
11. #5	730	600	725	550	710
12. #6	780	645	780	730	745
13. #7	670	740	660	790	795
14. #8	615	880	760	890	815
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

Data Sheet 6002-1

UNIT OPERATING DATA

Run No. 1 of 3

Test No. ______ Date 10-17-79 Location 5 Engr. ______

Unit No. 10 Fuel Wood Capacity 200,000 # STM/HR (wood fuel only) 250,000 # STM/HR (wood + No 6 oil)

Unit Type Hogged Fuel Power Boiler Burner Type Spreader Stoker

1. Test Number	5/7-1				
2. Date	10-17-79				
3. Time	15:05				
4. Load					
5. Process Rate	170				
6. 400# STM FLOW INTGR (×1000 = lb)	1801423				
7. 125# STM FLOW INTGR (×10³ lb)	9056125				
8. WOOD FLOW INTGR (×1000 lb)	6525481				
9. OIL FLOW INTGR (×20 = lb)	1048891				
10. 400# STM FLOW (from Intgr) - lb/h	148764				
11. 125# STM FLOW (from Intgr) - lb/h	-				
12. TOT. STM FLOW - lb/h	170,000				
13. WOOD FLOW (from Intgr) - lb/h	-				
14. OIL FLOW (from Intgr) - lb/h	-				
15. 400# STM FLOW - lb/h					
16. 125# STM FLOW - lb/h					
17. STM HDR PRESS. - psig	340				
18. STM PRESS, DESUPH OUT - psig	370				
19. STM TEMP SUPH - °F	625				
20. STM. TEMP DESUPH - °F	600				
21. TOT. COMB AIR - %	58				
22. OIL AIR - %	-				
23. WOOD AIR - %	57				
24. WOOD FLOW - 10³ lb/h	55				
25. OIL FLOW - 10³ lb/h	-				
26. OIL PRESS. - psig	-				
27. OIL TEMP - °F	-				
28. A.H. GAS IN TEMP - °F	660				
29. A.H. GAS OUT TEMP - °F	460				
30. A.H. AIR IN TEMP - °F	160				

Baseline

Data Sheet 6002-1

UNIT OPERATING DATA

Page ~~Sheet~~ No. 2 of 3

Test No. ______ **Date** ______ **Location** 5 **Engr.** ______

Unit No. 10 **Fuel** ______ **Capacity** ______

Unit Type Hogged Fuel Power Boiler **Burner Type** ______

1. Test Number	5/7-1				
2. Date	10-17-79				
3. Time	15:05				
4. Load	170				
5. Process Rate					
6. A.H. Air out Temp - °F	520				
7. F.D. Fan out Press. - iwg	5.1				
8. A.H. in Press. - iwg	4.5				
9. A.H. out Press. - iwg	3.2				
10. Windbox - Left Press. - iwg	0				
11. Windbox - Right Press. - iwg	0				
12. Overfire Air - Left Press. - iwg	2.5				
13. Overfire Air - Right Press. - iwg	2.6				
14. Undergrate Windbox - Left Press. - iwg	2.1				
15. Undergrate Windbox - Rt. Press. - iwg	1.6				
16. Undergrate Rear Press. - iwg	.5				
17. Undergrate 3rd Zone Press. - iwg	.8				
18. Undergrate 2nd Zone Press. - iwg	.8				
19. Undergrate Front Press. - iwg	.3				
20. Multiclone ~~Scrubber~~ ΔP - iwg	1.5				
21. Furnace Press. - iwg	-.5				
22. A.H. Gas out Press. - iwg	-5				
23. Blr. out Press. - iwg	-2.7				
24. Dust Coll. out Press. - iwg	-6.5				
25. I.D. Fan out Press. - iwg	-20				
26. Opacity - %	-				
27. Oxygen - %	5.0				
28. Combustibles - %	.2				
29. Aux. Air "AA"	closed				
30. Comments					

Data Sheet 6002-1

UNIT OPERATING DATA

Page ~~Sheet~~ No. 3 of 3

Test No.______ Date______ Location 5 Engr.______

Unit No. 10 Fuel______ Capacity______

Unit Type HOGGED FUEL PWR BLR. Burner Type SPREADER STOKER

1. Test Number	517-1				
2. Date	10-17-79				
3. Time	1505				
4. Load	170				
5. Process Rate					
6. GRATE TEMPS - °F					
7. #1	500				
8. #2	500				
9. #3	580				
10. #4	625				
11. #5	680				
12. #6	750				
13. #7	650				
14. #8	685				
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

Baseline

Data Sheet 6002-1

UNIT OPERATING DATA

Run No. 1 of 3

Test No.______ Date 10-18-79 Location 5 Engr. Ks

Unit No. 10 Fuel Wood Capacity 200,000 # STM/HR (wood fuel only) 250,000 # STM/HR (wood + No 6 oil)

Unit Type HOGGED FUEL POWER BOILER Burner Type SPREADER STOKER

1. Test Number	5/7-1a	5/7-2a	5/7-1a	5/7-1a	
2. Date	10-18-79	10-18-79	10-18-79	10-18-79	
3. Time	945	11:15	12:50	14:00	
4. Load	162	160	160	157	
5. Process Rate	—	—			
6. 400# STM FLOW INTGR (×1000 lb)	1804903	1805147	1805373	1805546	
7. 125# STM FLOW INTGR (×1000 lb)	9073954	9075155	9076125	9076907	
8. WOOD FLOW INTGR (×1000 lb)	6536911	6537889	6538787	6539450	
9. OIL FLOW INTGR (×20 lb)	1051144	1051144	1051144	1051144	
10. 400# STM FLOW (from Intgr) - lb/h	-	—	—	149882	
11. 125# STM FLOW (from Intgr) - lb/h	-	—	—		
12. TOT. STM FLOW - lb/h	162,000	16,000	160,000	157,000	
13. WOOD FLOW (from Intgr) - lb/h	-	—	—	—	
14. OIL FLOW (from Intgr) - lb/h	-	—	—	—	
15. 400# STM FLOW - lb/h	-	—	—	49	
16. 125# STM FLOW - lb/h	-	-	—	—	
17. STM HDR. PRESS. - psig	390	390	340	405	
18. STM PRESS, DESUPHOUT - psig	410	410	360	380	
19. STM TEMP SUPH - °F	625	625	615	620	
20. STM. TEMP DESUPH - °F	600	600	600	600	
21. TOT. COMB AIR - %	74	57	55	64	
22. OIL AIR - %	0	17	17	0	
23. WOOD AIR - %	73	47	44	63	
24. WOOD FLOW - 10^3 lb/h	70	61	57		
25. OIL FLOW - 10^3 lb/h	—	-	-	-	
26. OIL PRESS. - psig	-	-	-	-	
27. OIL TEMP - °F	-	-	-	-	
28. A.H. GAS IN TEMP - °F	660	645	640	665	
29. A.H. GAS OUT TEMP - °F	440	445	435	440	
30. A.H. AIR IN TEMP - °F	172	165	170	130	

Baseline as set by operator

Low NOx Frequent Load and Wood Changes. PSM & Brink

Low NOx (better wood)

Baseline

Data Sheet 6002-1

UNIT OPERATING DATA

Page No. 2 of 3

Test No.______ Date______ Location 5 Engr.______

Unit No. 10 Fuel Wood Capacity______

Unit Type Hogged Fuel Power Boiler Burner Type______

1. Test Number	5/7-2A	5/7-2A	5/7-2A	5/7-1A	
2. Date	10-18-79	10-18-79	10-18-79	10-18-79	
3. Time	9:45	11:15	12:50	14:00	
4. Load	163	160	160	157	
5. Process Rate					
6. A.H. Air out Temp - °F	500	510	510	512	
7. F.D. Fan out Press. - iwg	9.5	5.0	4.9	6.5	
8. A.H. in Press. - iwg	7.1	4.0	4.0	5.7	
9. A.H. out Press. - iwg	5.0	3.0	2.9	4.0	
10. Windbox - Left Press. - iwg	0	1.2	1.1	0	
11. Windbox - Right Press. - iwg	0	1.2	1.2	0	
12. Overfire Air - Left Press. - iwg	4.5	2.5	2.2	3.4	
13. Overfire Air - Right Press. - iwg	4.5	2.5	2.4	3.4	
14. Undergrate Windbox - Left Press. - iwg	3.4	1.8	1.6	2.5	
15. Undergrate Windbox - Rt. Press. - iwg	3.0	1.2	1.2	2.2	
16. Undergrate Rear Press. - iwg	.9	.4	.3	.7	
17. Undergrate 3rd Zone Press. - iwg	1.2	.6	.6	1.0	
18. Undergrate 2nd Zone Press. - iwg	1.3	.5	.5	1.0	
19. Undergrate Front Press. - iwg	.4	.2	.1	.1	
20. Boiler ~~Scrubber~~ ΔP - iwg	2.5	1.5	1.4	1.9	
21. Furnace Press. - iwg	-.6	-.5	-.5	-.5	
22. A.H. Gas out Press. - iwg	-6.5	-5	-4.5	-5.2	
23. Blr. out Press. - iwg	-3.4	-2.6	-2.4	-2.7	
24. Dust Coll. out Press. - iwg	-8.5	-6.5	-6.0	-7.4	
25. I.D. Fan out Press. - iwg	-16	-20	-19	-20	
26. Opacity - %	-	-	-	-	
27. Oxygen - %	7.0	5.0	6.0	6.0	
28. Combustibles - %	.15	.15	.3	.1	
29. Aux "AA" % open	0	10	10	0	
30. Comments					

Data Sheet 6002-1

Page ~~Sheet~~ No. 3 of 3

UNIT OPERATING DATA

Test No.________ Date 10-18-79 Location 5 Engr.________

Unit No. 10 Fuel Wood. Capacity________

Unit Type HOGGED FUEL PWR. BLR. Burner Type SPREADER STOKER

5/7-1a

1. Test Number	5/7-1a	5/7-2a	5/7-2a	5/7-2a	
2. Date	10-18-79				→
3. Time	9:45	11:15	12:50	140	
4. Load	162	160	160	157	
5. Process Rate	–	–	–	–	
6. GRATE TEMPS - °F	–	–	–	–	
7. #1	465	485	485	465	
8. #2	475	490	490	480	
9. #3	500	580	540	520	
10. #4	565	520	610	545	
11. #5	760	760	715	785	
12. #6	820	815	760	820	
13. #7	535	610	690	580	
14. #8	520	525	705	530	
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

Data Sheet 6002-1

UNIT OPERATING DATA

Page ~~Sheet~~ No. 1 of 3

Test No. 5/7-1b Date 10-22-79 Location 5 Engr. TIDONA

Unit No. 10 Fuel HOGGED WOOD Capacity 200,000 # STM/HR (Wood fuel only)
250,000 # STM/HR (Wood + No. 6 oil)

Unit Type HOGGED FUEL POWER BOILER Burner Type SPREADER STOKER

	BASELINE	BRINK LOW NO_x →			
1. Test Number	5/7-1B	5/7-2B	5/7-2B		
2. Date	10/22/79	10/22/79	10/22/79		
3. Time	13:54	16:03	17:32		
4. Load	160000	160000	160000		
5. Process Rate					
6. 400# STM FLOW INTGR. (×1000=lb)	1820339	1820637	1820848		
7. 125# STM FLOW INTGR. (×10=lb)	9161649	9163037	9163641		
8. WOOD FLOW INTGR. (×100=lb)	658 5890	6587168	6588066		
9. OIL FLOW INTGR (×20=lb)	1060763	1060763	1060763		
10. 400# STM FLOW (from Intgr.) - lb/h					
11. 125# STM FLOW (from Intgr.) - lb/h					
12. TOT. STM FLOW - lb/h			140092		
13. WOOD FLOW (from Intgr.) - lb/h			59890		
14. OIL FLOW (from Intgr.) - lb/h			0		
15. 400# STM FLOW - lb/h	150000	150000	175000		
16. 125# STM FLOW - lb/h	6700	4300	5000		
17. STM. HDR. PRESS. - psig	375	380	385		
18. STM. PRESS., DESUPH OUT - psig	395	395	410		
19. STM. TEMP. SUPH - °F	640	655	650		
20. STM. TEMP., DESUPH - °F	595	600	590		
21. TOT. COMB AIR - %	52	42	67.0		
22. OIL AIR - %	0	13	20.0		
23. WOOD AIR - %	53	32	52.0		
24. WOOD FLOW - 10^3 lb/h	50.0	64.0	56.0		
25. OIL FLOW - 10^3 lb/h	0	0	0		
26. OIL PRESS. - psig	—	—	—		
27. OIL TEMP - °F	—	—	—		
28. A.H. GAS IN TEMP. - °F	630	630	675		
29. A.H. GAS OUT TEMP. - °F	430	450	455		
30. A.H. AIR IN TEMP. - °F	180	170	145		

LOAD CHANGE
FUEL CHANGE

Data Sheet 6002-1

UNIT OPERATING DATA

Page No. 2 of 3

Test No.______ Date______ Location 5 Engr.______

Unit No. 10 Fuel______ Capacity______

Unit Type HOGGED FUEL POWER BOILER Burner Type______

1. Test Number	5/7-1B	5/7-2B	5/7-2B		
2. Date	10/22/79	10/22/79	10/22/79		
3. Time					
4. Load					
5. Process Rate	160000	160000	160000		
6. A.H. AIR OUT TEMP - °F	500	510	530		
7. F.D. FAN OUT PRESS. - iwg	4.5	2.5	7.0		
8. A.H. IN PRESS. - iwg	3.5	2.0	6.0		
9. A.H. OUT PRESS. - iwg	3.0	1.5	4.0		
10. WINDBOX - LEFT PRESS. - iwg	0.5	0.0	1.0		
11. WINDBOX - RIGHT PRESS. - iwg	0.6	0.1	1.2		
12. OVERFIRE AIR - LEFT PRESS. - iwg	2.5	1.1	3.5		
13. OVERFIRE AIR - RIGHT PRESS. - iwg	2.5	1.1	3.5		
14. UNDERGRATE WINDBOX - LEFT PRESS. iwg	1.5	0.5	2.6		
15. UNDERGRATE WINDBOX - RT. PRESS. - iwg	1.0	0.2	2.6		
16. UNDERGRATE REAR PRESS. - iwg	0.7	0.1	0.8		
17. UNDERGRATE 3rd ZONE PRESS. - iwg	1.0	0.2	1.1		
18. UNDERGRATE 2nd ZONE PRESS. - iwg	1.1	0.1	1.2		
19. UNDERGRATE FRONT PRESS. - iwg	0.1	0.0	0.3		
20. SCRUBBER ΔP - iwg	-12.7	-13.0	-12.6		
21. FURNACE PRESS. - iwg	-0.4	-0.5	-0.4		
22. A.H. GAS OUT PRESS. - iwg	-4.0	-4.0	-6.5		
23. BLR. OUT PRESS. - iwg	-1.9	-2.0	-3.0		
24. DUST COLL. OUT PRESS. - iwg	-5.5	-5.0	-9.0		
25. I.D. FAN OUT PRESS. - iwg	+19.0	+19.0	+22.0		
26. OPACITY - %	I.O.O.S.	→	→		
27. OXYGEN - %	7.0	4.0	2.0 - 6.0 varying		
28. COMBUSTIBLES - %	0.1	0.1	0.1		
29. AUX AIR "AA" DPR - %	CLOSED	10	10		
30. COMMENTS			HOG FUEL CHANGE AT 17:00		

Data Sheet 6002-1

UNIT OPERATING DATA

Page ~~Sheet~~ No. 3 of 3

Test No. 5/7-1B-2B Date ____ Location 5 Engr. ____

Unit No. 10 Fuel ____ Capacity ____

Unit Type HOGGED FUEL PWR. BLR. Burner Type SPREADER STOKER

1. Test Number	5/7-1B	5/7-2B	5/7-2B		
2. Date	10/22/79	10/22/79	10/22/79		
3. Time	14:04	16:33	17:39		
4. Load	160000	160000	160000		
5. Process Rate					
6. GRATE TEMPS - °F					
7. #1	460	500	520		
8. #2	480	500	540		
9. #3	520	570	610		
10. #4	570	650	700		
11. #5	760	630	700		
12. #6	800	700	750		
13. #7	500	700	700		
14. #8	490	880	600		
15.					
16.					
17.					
18. Normal Settings for					
19. other Aux. air dampers					
20. are shown below					
21.	% OPEN				
22. O.F.A. "C"	0				
23. Aux. Air "BC"	0				
24. Coal/Air "AB"	~15				
25. Oil/Air "AB"	~8				
26. Coal/Air "A"	~15				
27. Aux Air "AA"	0				
28.					
29.					
30.					

Data Sheet 6002-1

UNIT OPERATING DATA

Page No. 1 of 3

Test No. 5/7-1C to x Date 10-23-79 Location 5 Engr. Tidona

Unit No. 10 Fuel ______ Capacity 200,000 # STM/HR (Wood fuel only) 250,000 # STM/HR (Wood + No. 6 oil)

Unit Type HOGGED FUEL POWER BOILER Burner Type SPREADER STOKER

	BASELINE	LO-NO_x PARTICULATES →			
1. Test Number	5/7-1C	5/7-2C	5/7-2C	5/7-2C	
2. Date	10-23-79	10-23-79	10-23-79	10-23-79	
3. Time	17:47	18:26	23:15	23:56	
4. Load	160000	160000	160000	160000	
5. Process Rate					
6. 400# STM FLOW INTGR. (×100 = lb)	1824748	1824843	1825525	1825625	
7. 125# STM FLOW INTGR. (×10 = lb)	9182652	9183047	9186484	9187430	
8. WOOD FLOW INTGR. (×100 = lb)	6600068	6600438	6602938	6603264	
9. OIL FLOW INTGR (×20 = lb)	1064043	1064043	1064266	1064338	
10. 400# STM FLOW (from Intgr) - lb/h					
11. 125# STM FLOW (from Intgr) - lb/h					
12. TOT. STM FLOW - lb/h				142602	
13. WOOD FLOW (from Intgr) - lb/h				51967	
14. OIL FLOW (from Intgr) - lb/h				959	
15. 400# STM FLOW - lb/h	165000	150000	160000	165000	
16. 125# STM FLOW - lb/h	4800	5500	7800	6500	
17. STM. HDR. PRESS. - psig	385	380	385	385	
18. STM. PRESS, DESUPH OUT - psig	415	400	410	415	
19. STM. TEMP, SUPH - °F	640	645	655	655	
20. STM. TEMP, DESUPH - °F	600	600	605	600	
21. TOT. COMB AIR - %	61	42	53.5	53	
22. OIL AIR - %	0	15	14	15	
23. WOOD AIR - %	57	31	43	41	
24. WOOD FLOW - 10^3 lb/h	57.0	62.0	54.0	50.0	
25. OIL FLOW - 10^3 lb/h	0	0	1.6	1.6	
26. OIL PRESS. - psig	–	–	45	45	
27. OIL TEMP - °F	–	–	220	220	
28. A.H. GAS IN TEMP. - °F	665	640	635	640	
29. A.H. GAS OUT TEMP. - °F	440	450	440	440	
30. A.H. AIR IN TEMP. - °F	145	185	185	170	

WOOD FUEL
CHANGE @
2100 HRS

Data Sheet 6002-1

UNIT OPERATING DATA

~~Sheet~~ Page No. 2 of 3

Test No. ______ Date ______ Location 5 ______ Engr. ______

Unit No. 10 Fuel ______ Capacity ______

Unit Type HOGGED FUEL POWER BOILER Burner Type ______

1. Test Number	5/7-1C	5/7-2C	5/7-2C	5/7-2C	
2. Date	10-23-79	10-23-79	10-23-79	10-23-79	
3. Time					
4. Load	160000	160000	160000	160000	
5. Process Rate					
6. A.H. AIR OUT TEMP - °F	510	520	500	500	
7. F.D. FAN OUT PRESS. - iwg	5.5	3.0	4.5	4.5	
8. A.H. IN PRESS. - iwg	5.0	2.0	3.7	3.5	
9. A.H. OUT PRESS. - iwg	3.5	1.5	2.5	2.5	
10. WINDBOX - LEFT PRESS. - iwg	0.1	0.2	0.5	0.5	
11. WINDBOX - RIGHT PRESS. - iwg	0.3	0.2	0.6	0.7	
12. OVERFIRE AIR - LEFT PRESS. - iwg	2.7	1.2	2.0	2.0	
13. OVERFIRE AIR - RIGHT PRESS. - iwg	2.7	1.2	2.0	2.0	
14. UNDERGRATE WINDBOX - LEFT PRESS. - iwg	2.0	0.6	1.2	1.3	
15 UNDERGRATE WINDBOX - RT. PRESS. - iwg	1.4	0.2	0.8	0.9	
16. UNDERGRATE REAR PRESS. - iwg	0.6	0.2	0.2	0.3	
17. UNDERGRATE 3rd ZONE PRESS. - iwg	0.9	0.3	0.4	0.5	
18. UNDERGRATE 2nd ZONE PRESS. - iwg	1.0	0.2	0.3	0.4	
19. UNDERGRATE FRONT PRESS. - iwg	0.3	0.0	0.0	0.0	
20. SCRUBBER ΔP - iwg	-12.8	-13.0	-12.9	-12.9	
21. FURNACE PRESS. - iwg	-0.4	-0.5	-0.4	-0.4	
22. A.H. GAS OUT PRESS. - iwg	-5.5	-4.3	-5.0	-4.9	
23. BLR. OUT PRESS. - iwg	-2.9	-2.0	-2.5	-2.4	
24. DUST COLL. OUT PRESS. - iwg	-7.0	-5.2	-6.0	-6.0	
25. I.D. FAN OUT PRESS. - iwg	+20.0	+19.0	+20.0	+20.0	
26. OPACITY - %	I.O.O.S.	I.O.O.S.	→	→	
27. OXYGEN - %	6.2	3.7	5.5	5.0	
28. COMBUSTIBLES - %	0.1	0.1	0.1	0.1	
29. AUX "AA" DPR - %	CLOSED	10	10	10	
30. COMMENTS	BASELINE	LO-NO_x	→	→	

Data Sheet 6002-1

UNIT OPERATING DATA

~~Sheet~~ Page No. 3 of 3

Test No.______ Date______ Location 5 Engr.______

Unit No. 10 Fuel______ Capacity______

Unit Type HOGGED FUEL PWR. BLR. Burner Type SPREADER STOKER

1. Test Number	5/7-1C	5/7-2C	5/7-2C	5/7-2C	
2. Date	10/23/79	10/23/79	10/23/79	10/23/79	
3. Time	17:53	18:36	23:23	24:00	
4. Load	160000	160000	160000	160000	
5. Process Rate					
6. GRATE TEMPS - °F					
7. #1	480	520	480	500	
8. #2	485	520	480	500	
9. #3	550	630	530	560	
10. #4	580	690	600	660	
11. #5	720	740	660	680	
12. #6	760	820	740	750	
13. #7	620	920	680	800	
14. #8	640	1000	790	750	
15.					
16.					
17.					
18.			WOOD CHANGE,		
19.			HAD TO FIRE		
20.			SOME OIL,		
21.			O_2 VARIED		
22.			DURING TEST		
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

Data Sheet 6002-1

HOGGED FUEL AND NO. 6 OIL ANALYSES

Sample Identification:

1. Wood fuel sample Loc. 5, 9-20-79, Test 5/2-1b
2. Wood fuel sample Loc. 5, 10-3-79, Test 5/2-4a
3. Wood fuel sample Loc. 5, 10-17-79, Test 5/7-2
4. No. 6 Fuel Oil Loc. 5, 9-13-79, Test 5/1-1
5. No. 6 Fuel Oil Loc. 5, 10-23-79, Test 5/7-2C

Wood Fuel Samples:

Proximate Analysis:

	1	2	3	Avg.
Moisture, %	51.76	44.64	50.05	48.82
Volatile Matter, %	37.59	42.27	38.29	39.38
Ash, %	2.55	3.64	2.02	2.74
Fixed Carbon, %	8.10	9.45	9.64	9.06

Ultimate Analysis (Dry Basis):

	1	2	3	Avg.	Avg. Ash-Free
Carbon, %	47.13	48.53	49.81	48.49	51.20
Hydrogen, %	5.66	5.50	5.69	5.62	5.93
Nitrogen, %	0.16	0.21	0.27	0.21	0.22
Sulfur, %	0.11	0.088	0.091	0.10	0.11
Ash, %	5.29	6.57	4.04	5.30	-
Oxygen, % (by difference)	41.65	39.10	40.10	40.28	42.53
Heat of Combustion (Dry Basis):					
Gross Btu/lb (kJ/kg)	8207 (19090)	8438 (19626)	8674 (20175)	8440 (19630)	8912 (20728)

No. 6 Fuel Oils

Ultimate Analysis:

	4	5	Avg.
Carbon, %	89.21	89.69	89.45
Hydrogen, %	8.27	7.65	7.96
Nitrogen, %	0.45	0.39	0.42
Sulfur, %	1.52	1.71	1.62
Ash, %	0.019	0.030	0.02
Oxygen, % (by difference)	0.53	0.53	0.53
Heat of Combustion:			
Gross Btu/lb (kJ/kg)	17,550 (40703)	17,220 (40052)	17,385 (40435)
Net Btu/lb (kJ/kg)	16,800 (39075)	16,520 (38424)	16,660 (38749)
API Gravity at 60°F	2.3	<0.7	

PARTICULATE EMISSION CALCULATIONS

Test No. 5/1-1 Date 9-18-79 Location 5 Engr. Tidona

Unit No. ______ Fuel HOGGED + No 6 Oil Sampling Train and Method JOY, METHOD 5

Pitot Factor, Fs .837 Barometric Pressure, P_{bar} 30.77 (STO 0) in. Hg

Tot. Liquid Collected, V_{lc} 216 (STO 1) ml Total Particulate, M_n 7026.1 (STO 2) m gm

Velocity Head, ΔP 0.33 (STO 3) iwg Stack Temp., Ts 610 (STO 4) °F Stack Area, As ~~107.5~~ (STO 5) ft² 100ft² 5' × ~~21.5'~~ 20.0'

Sample Volume, Vm 30.66 (STO 6) ft³ Stack Press., Psg -5.0 (STO 7) iwg Excess O_2, XO_2% 8.3 (STO 8) %

Orifice Press. Diff., H 0.35 (STO 9) iwg Stack Gas Sp. Gravity, Gs 1.0 (STO A) n.d.

Sample Time, θ 72 (STO B) min Nozzle Dia., Dn 0.245 (STO C) in. Meter Temp., T_m 114 (STO D) °F

Select F_e	Oil (A)	Gas (B)	Coal (C)	Other:
SC Feet/10^4 Btu	92.2	87.4	98.2	wood 96.6 (–)

Press (E) if meter is not temperature compensated.

1. Sample Gas Volume $Vm_{std} = 0.0334\ Vm(P_{bar} + H/13.6)$ 29.119 SCF
2. Water Vapor $Vw_{std} = 0.0474\ V_{lc}$ 10.238 SCF
3. Moisture Content Bwo = Eq. 2/(Eq. 1 + Eq. 2) 0.2601 N.D.
4. Concentration a. $C = 0.0154\ Mn/Vm_{std}$ 3.7053 grains/DSCF

   b. $C = 2.205 \times 10^{-6}\ Mn/Vm_{std}$ 5.306×10^{-4} lb/DSCF

   c. $C = \text{Eq. 4b} \times 16.018 \times 10^3$ 8.499 grams/DSCM
5. Abs. Stack Press. $Ps = P_{bar} \times 13.6 + Psg$ 413.5 in. w abs.
6. Stack Gas Speed $Vs = 174\ Fs \sqrt{\Delta PTs} \sqrt{\frac{407}{Ps} \times \frac{1.00}{Gs}}$ 2692.5 ft/min
7. Stack Gas Flow Rate @ 70°F a. $Qsw = \text{Eq. 6} \times As \times \frac{530}{Ts} \times \frac{Ps}{407}$ 135466 WSCF/min

   b. Qsd = Eq. 7a x (1. - Eq. 3) 100226 DSCF/min
8. Material Flow Ms = Eq. 7b x Eq. 4b x 60 3190.8 lb/hr
9. XO_2 factor $XO_2f = 2090/(20.9 - XO_2\%)$ 165.873 N.D.
10. Emission a. E = Eq. 4b x Fe x Eq. 9 8.502 lb/MMBtu

    b. E = Eq. 4c x Fm x Eq. 9 x 1000 3655.8 ng/joule
11. % Isokinetic $I = \dfrac{14077 \times Ts(Vm_{std} + Vw_{std})}{\theta \times Vs \times Ps \times Dn^2}$ 123.21 %

*If calculating by hand:
1) Convert T_s and T_m to °R
2) Multiply EQ 1 by $530/T_m$(°R) if meter not temperature compensated.
3) $F_m = 2.684 \times 10^{-5} \times F_e$

Data Sheet 6002-4
Revised 2/15/78

HP-67 KEYED CALCULATION SHEET*

PARTICULATE EMISSION CALCULATIONS

Test No. 5/2-1B Date 9/20/79 Location 5, BLR OUT Engr. J. DANA

Unit No. 10 Fuel HOGGED WOOD Sampling Train and Method JOY, METH, 5

Pitot Factor, Fs .837 Barometric Pressure, P_{bar} 30.66 (STO 0) in. Hg

Tot. Liquid Collected, V_{1c} 162.5 (STO 1) ml Total Particulate, M_n 5006.3 (STO 2) m gm

Velocity Head, ΔP 0.350 (STO 3) iwg Stack Temp., Ts 671 (STO 4) °F Stack Area, As 100.0 (STO 5) ft^2

Sample Volume, Vm 38.36 (STO 6) ft^3 Stack Press., Psg −4.7 (STO 7) iwg Excess O_2, XO_2% 8.7 (STO 8) %

Orifice Press. Diff., H 0.162 (STO 9) iwg Stack Gas Sp. Gravity, Gs 0.96 (STO A) n.d.

Sample Time, θ 96 (STO B) min Nozzle Dia., Dn 0.245 (STO C) in. Meter Temp., T_m 124 (STO D) °F

Select F_e	Oil (A)	Gas (B)	Coal (C)	Other: WOOD
SC Feet/10^4 Btu	92.2	87.4	98.2	96.6 (E)

Press (E) if meter is not temperature compensated.

1. Sample Gas Volume $Vm_{std} = 0.0334\ Vm(P_{bar} + H/13.6)$ 35.6639 SCF
2. Water Vapor $Vw_{std} = 0.0474\ V_{1c}$ 7.7025 SCF
3. Moisture Content $Bwo = Eq.\ 2/(Eq.\ 1 + Eq.\ 2)$ 0.1776 N.D.
4. Concentration a. $C = 0.0154\ Mn/Vm_{std}$ 2.1618 grains/DSCF
   b. $C = 2.205 \times 10^{-6}\ Mn/Vm_{std}$ 309.56×10^{-6} lb/DSCF
   c. $C = Eq.\ 4b \times 16.018 \times 10^3$ 4.9586 grams/DSCM
5. Abs. Stack Press. $Ps = P_{bar} \times 13.6 + Psg$ 412.28 in. w abs.
6. Stack Gas Speed $Vs = 174\ Fs\ \sqrt{\Delta P Ts}\sqrt{\frac{407}{Ps} \times \frac{1.00}{Gs}}$ 2.9138×10^3 ft/min
7. Stack Gas Flow Rate @ 70°F a. $Qsw = Eq.\ 6 \times As \times \frac{530}{Ts} \times \frac{Ps}{407}$ 138.29×10^3 WSCF/min
   b. $Qsd = Eq.\ 7a \times (1. - Eq.\ 3)$ 113.73×10^3 DSCF/min
8. Material Flow $Ms = Eq.\ 7b \times Eq.\ 4b \times 60$ 2.1124×10^3 lb/hr
9. XO_2 factor $XO_2f = 2090/(20.9 - XO_2\%)$ 171.31 N.D.
10. Emission a. $E = Eq.\ 4b \times Fe \times Eq.\ 9$ 5.1229 lb/MMBtu
    b. $E = Eq.\ 4c \times Fm \times Eq.\ 9 \times 1000$ 2.2028×10^3 ng/joule
11. % Isokinetic $I = \frac{14077 \times Ts(Vm_{std} + Vw_{std})}{\theta \times Vs \times Ps \times Dn^2}$ 99.740 %

*If calculating by hand:
1) Convert T_s and T_m to °R
2) Multiply EQ 1 by $530/T_m$(°R) if meter not temperature compensated.
3) $F_m = 2.684 \times 10^{-5} \times F_e$

Data Sheet 6002-4
Revised 2/15/78

HP-67 KEYED CALCULATION SHEET*

PARTICULATE EMISSION CALCULATIONS

Test No. 5/2-1C Date 9/24/79 Location 5, Blr. Out. Engr. Tibma

Unit No. 10 Fuel HOGGED [illegible] Sampling Train and Method JOY, METH. 5

Pitot Factor, Fs .837 Barometric Pressure, P_{bar} 30.75 (STO 0) in. Hg

Tot. Liquid Collected, V_{1c} 216.5 (STO 1) ml Total Particulate, M_n 7840.4 (STO 2) m gm

Velocity Head, ΔP 0.360 (STO 3) iwg Stack Temp., Ts 643 (STO 4) °F Stack Area, As 100.0 (STO 5) ft^2

Sample Volume, Vm 4308 (STO 6) ft^3 Stack Press., Psg -3.5 (STO 7) iwg Excess O_2, XO_2% 9.6 (STO 8) %

Orifice Press. Diff., H 0.386 (STO 9) iwg Stack Gas Sp. Gravity, Gs 0.96 (STO A) n.d.

Sample Time, θ 96 (STO B) min Nozzle Dia., Dn 0.245 (STO C) in. Meter Temp., T_m 103 (STO D) °F

Select F_e	Oil (A)	Gas (B)	Coal (C)	Other: WOOD
SC Feet/10^4 Btu	92.2	87.4	98.2	96.6 (-)

Press (E) if meter is not temperature compensated.

1.	Sample Gas Volume	$Vm_{std} = 0.0334\ Vm(P_{bar} + H/13.6)$	41.690	SCF
2.	Water Vapor	$Vw_{std} = 0.0474\ V_{1c}$	10.262	SCF
3.	Moisture Content	$Bwo = Eq.\ 2/(Eq.\ 1 + Eq.\ 2)$	0.1975	N.D.
4.	Concentration	a. $C = 0.0154\ Mn/Vm_{std}$	2.8962	grains/DSCF
		b. $C = 2.205 \times 10^{-6}\ Mn/Vm_{std}$	414.73×10^{-6}	lb/DSCF
		c. $C = Eq.\ 4b \times 16.018 \times 10^3$	6.6432	grams/DSCM
5.	Abs. Stack Press.	$Ps = P_{bar} \times 13.6 + Psg$	414.70	in. w abs.
6.	Stack Gas Speed	$Vs = 174\ Fs\ \sqrt{\Delta P Ts}\sqrt{\frac{407}{Ps} \times \frac{1.00}{Gs}}$	2.9098×10^3	ft/min
7.	Stack Gas Flow Rate @ 70°F	a. $Qsw = Eq.\ 6 \times As \times \frac{530}{Ts} \times \frac{Ps}{407}$	142.44×10^3	WSCF/min
		b. $Qsd = Eq.\ 7a \times (1. - Eq.\ 3)$	114.31×10^3	DSCF/min
8.	Material Flow	$Ms = Eq.\ 7b \times Eq.\ 4b \times 60$	2.8444×10^3	lb/hr
9.	XO_2 factor	$XO_2f = 2090/(20.9 - XO_2\%)$	184.96	N.D.
10.	Emission	a. $E = Eq.\ 4b \times Fe \times Eq.\ 9$	7.4019	lb/MMBtu
		b. $E = Eq.\ 4c \times Fm \times Eq.\ 9 \times 1000$	3.1863×10^3	ng/joule
11.	% Isokinetic	$I = \frac{14077 \times Ts(Vm_{std} + Vw_{std})}{\theta \times Vs \times Ps \times Dn^2}$	116.01	%

*If calculating by hand:

1) Convert T_s and T_m to °R
2) Multiply EQ 1 by $530/T_m$(°R) if meter not temperature compensated.
3) $F_m = 2.684 \times 10^{-5} \times F_e$

Data Sheet 6002-6
Revised 2/15/78

HP-67 KEYED CALCULATION SHEET*

PARTICULATE EMISSION CALCULATIONS

Test No. 5/2-1C Date 9/24/78 Location 5 (MULTICLONE OUT) Engr. T. DUNA

Unit No. 10 Fuel HOGGED + N. GAS Sampling Train and Method JOY, METH. 5

Pitot Factor, Fs .837 Barometric Pressure, P_{bar} 30.75 (STO 0) in. Hg

Tot. Liquid Collected, V_{1c} 141.5 (STO 1) ml Total Particulate, M_n 2745.6 (STO 2) m gm

Velocity Head, ΔP 0.095 (STO 3) iwg Stack Temp., Ts 451 (STO 4) °F Stack Area, As 120.7 (STO 5) ft^2

Sample Volume, Vm 37.32 (STO 6) ft^3 Stack Press., Psg -14.0 (STO 7) iwg Excess O_2, XO_2% 9.6 (STO 8) %

Orifice Press. Diff., H 0.275 (STO 9) iwg Stack Gas Sp. Gravity, Gs 0.96 (STO A) n.d.

Sample Time, θ 70 (STO B) min Nozzle Dia., Dn 0.372 (STO C) in. Meter Temp., T_m 108 (STO D) °F

Select Fe	Oil (A)	Gas (B)	Coal (C)	Other: WOOD
SC Feet/10^4 Btu	92.2	87.4	98.2	96.6 (D)

Press (E) if meter is not temperature compensated.

1. Sample Gas Volume $Vm_{std} = 0.0334\ Vm(P_{bar} + H/13.6)$ 35.789 SCF
2. Water Vapor $Vw_{std} = 0.0474\ V_{1c}$ 6.7071 SCF
3. Moisture Content Bwo = Eq. 2/(Eq. 1 + Eq. 2) 0.1578 N.D.
4. Concentration a. $C = 0.0154\ Mn/Vm_{std}$ 1.1814 grains/DSCF
   b. $C = 2.205 \times 10^{-6}\ Mn/Vm_{std}$ 169.18×10^{-6} lb/DSCF
   c. $C = \text{Eq. 4b} \times 16.018 \times 10^3$ 2.7100 grams/DSCM
5. Abs. Stack Press. $Ps = P_{bar} \times 13.6 + Psg$ 404.20 in. w abs.
6. Stack Gas Speed $Vs = 174\ Fs \sqrt{\Delta P Ts}\sqrt{\frac{407}{Ps} \times \frac{1.00}{Gs}}$ 1.3760×10^3 ft/min
7. Stack Gas Flow Rate @ 70°F a. $Qsw = \text{Eq. 6} \times As \times \frac{530}{Ts} \times \frac{Ps}{407}$ 95.943×10^3 WSCF/min
   b. Qsd = Eq. 7a x (1. - Eq. 3) 80.800×10^3 DSCF/min
8. Material Flow Ms = Eq. 7b x Eq. 4b x 60 820.20 lb/hr
9. XO_2 factor $XO_2f = 2090/(20.9 - XO_2\%)$ 184.96 N.D.
10. Emission a. E = Eq. 4b x Fe x Eq. 9 3.0227 lb/MMBtu
    b. E = Eq. 4c x Fm x Eq. 9 x 1000 1.2998×10^3 ng/joule
11. % Isokinetic $I = \frac{14077 \times Ts(Vm_{std} + Vw_{std})}{\theta \times Vs \times Ps \times Dn^2}$ 101.15 %

*If calculating by hand:
1) Convert T_s and T_m to °R
2) Multiply EQ 1 by $530/T_m$(°R) if meter not temperature compensated.
3) $F_m = 2.684 \times 10^{-5} \times F_e$

Data Sheet 6002-4
Revised 2/15/78

HP-67 KEYEᴅ CALCULATION SHEET
PARTICULATE EMISSION CALCULATIONS

Test No. 5/2-1E Date 9/26/79 Location 5, Blr. Out. Engr. Tidona

Unit No. 10 Fuel HOGGED Sampling Train and Method JOY, METH. 5

Pitot Factor, Fs .837 Barometric Pressure, P_{bar} 30.74 (STO 0) in. Hg

Tot. Liquid Collected, V_{1c} 293 (STO 1) ml Total Particulate, M_n 4149.3 (STO 2) m gm

Velocity Head, ΔP 0.35 (STO 3) iwg Stack Temp., Ts 701 (STO 4) °F Stack Area, As 100.0 (STO 5) ft^2

Sample Volume, Vm 47.19 (STO 6) ft^3 Stack Press., Psg -4.0 (STO 7) iwg Excess O_2, XO_2% 7.1 (STO 8) %

Orifice Press. Diff., H 0.15 (STO 9) iwg Stack Gas Sp. Gravity, Gs 0.96 (STO A) n.d.

Sample Time, θ 120 (STO B) min Nozzle Dia., Dn 0.245 (STO C) in. Meter Temp., T_m 108 (STO D) °F

Select Fe	Oil (A)	Gas (B)	Coal (C)	Other: WOOD
SC Feet/10^4 Btu	92.2	87.4	98.2	96.6 (E)

Press (E) if meter is not temperature compensated.

1. Sample Gas Volume	$Vm_{std} = 0.0334\ Vm(P_{bar} + H/13.6)$	45.2255	SCF (dry)
2. Water Vapor	$Vw_{std} = 0.0474\ V_{1c}$	13.8882	SCF
3. Moisture Content	Bwo = Eq. 2/(Eq. 1 + Eq. 2)	0.2349	N.D.
4. Concentration	a. $C = 0.0154\ Mn/Vm_{std}$	1.4129	grains/DSCF
	b. $C = 2.205 \times 10^{-6}\ Mn/Vm_{std}$	202.33×10^{-6}	lb/DSCF
	c. $C = \text{Eq. 4b} \times 16.018 \times 10^3$	3.2409	grams/DSCM
5. Abs. Stack Press.*	$Ps = P_{bar} \times 13.6 + Psg$	414.064	in. w abs.
6. Stack Gas Speed	$Vs = 174\ Fs \sqrt{\Delta P Ts} \sqrt{\frac{407}{Ps} \times \frac{1.00}{Gs}}$	2.9459×10^3	ft/min
7. Stack Gas Flow Rate @ 70°F	a. $Qsw = \text{Eq. 6} \times As \times \frac{530}{Ts} \times \frac{Ps}{407}$	136.79×10^3	WSCF/min
	b. Qsd = Eq. 7a x (1. - Eq. 3)	104.65×10^3	DSCF/min
8. Material Flow	Ms = Eq. 7b x Eq. 4b x 60	1.2705×10^3	lb/hr
9. XO_2 factor	$XO_2f = 2090/(20.9 - XO_2\%)$	151.45	N.D.
10. Emission	a. E = Eq. 4b x Fe x Eq. 9	2.9601	lb/MMBtu
	b. E = Eq. 4c x Fm x Eq. 9 x 1000	1.2728×10^3	ng/joule
11. % Isokinetic	$I = \frac{14077 \times Ts(Vm_{std} + Vw_{std})}{\theta \times Vs \times Ps \times Dn^2}$	109.96	%

*If calculating by hand:
1) Convert T_s and T_m to °R
2) Multiply EQ 1 by $530/T_m$(°R) if meter not temperature compensated.
3) $F_m = 2.684 \times 10^{-5} \times F_e$

Data Sheet 6002-4
Revised 2/15/78

HP-67 KEYED CALCULATION SHEET*

PARTICULATE EMISSION CALCULATIONS

Test No. 5/2-4A Date 10/3/79 Location 5 , Blr. Out Engr. Tidona

Unit No. 10 Fuel HOGGED WOOD Sampling Train and Method Joy, Meth. 5

Pitot Factor, Fs .837 Barometric Pressure, P_{bar} 30.66 (STO 0) in. Hg

Tot. Liquid Collected, V_{1c} 172.0 (STO 1) ml Total Particulate, M_n 103432 (STO 2) m gm

Velocity Head, ΔP 0.255 (STO 3) iwg Stack Temp., Ts 684 (STO 4) °F Stack Area, As 100.0 (STO 5) ft^2

Sample Volume, Vm 34.245 (STO 6) ft^3 Stack Press., Psg −4.0 (STO 7) iwg Excess O_2, XO_2% 5.0 (STO 8) %

Orifice Press. Diff., H 0.120 (STO 9) iwg Stack Gas Sp. Gravity, Gs 0.96 (STO A) n.d.

Sample Time, θ 102 (STO B) min Nozzle Dia., Dn 0.245 (STO C) in. Meter Temp., T_m 104 (STO D) °F

Select F_e	Oil (A)	Gas (B)	Coal (C)	Other: WOOD
SC Feet/10^4 Btu	92.2	87.4	98.2	96.6 (D)

Press (E) if meter is not temperature compensated.

1. Sample Gas Volume $Vm_{std} = 0.0334\ Vm(P_{bar} + H/13.6)$ 32.964 ✓ SCF
2. Water Vapor $Vw_{std} = 0.0474\ V_{1c}$ 8.3898 ✓ SCF
3. Moisture Content $Bwo = Eq.\ 2/(Eq.\ 1 + Eq.\ 2)$ 0.2029 ✓ N.D.
4. Concentration a. $C = 0.0154\ Mn/Vm_{std}$ 4832 ✓ grains/DSCF

   b. $C = 2.205 \times 10^{-6}\ Mn/Vm_{std}$ .00069 ✓ lb/DSCF

   c. $C = Eq.\ 4b \times 16.018 \times 10^3$ 11.08 ✓ grams/DSCM
5. Abs. Stack Press. $Ps = P_{bar} \times 13.6 + Psg$ 412.98 in. w abs.
6. Stack Gas Speed $Vs = 174\ Fs \sqrt{\Delta PTs} \sqrt{\frac{407}{Ps} \times \frac{1.00}{Gs}}$ 2.4993×10^3 ft/min
7. Stack Gas Flow Rate @ 70°F a. $Qsw = Eq.\ 6 \times As \times \frac{530}{Ts} \times \frac{Ps}{407}$ 117469 WSCF/min

   b. $Qsd = Eq.\ 7a \times (1. - Eq.\ 3)$ 93637 DSCF/min
8. Material Flow $Ms = Eq.\ 7b \times Eq.\ 4b \times 60$ 3887 lb/hr
9. XO_2 factor $XO_2f = 2090/(20.9 - XO_2\%)$ 131.45 N.D.
10. Emission a. $E = Eq.\ 4b \times Fe \times Eq.\ 9$ 8.786 lb/MMBtu

    b. $E = Eq.\ 4c \times Fm \times Eq.\ 9 \times 1000$ 3778 ng/joule
11. % Isokinetic $I = \frac{14077 \times Ts(Vm_{std} + Vw_{std})}{\theta \times Vs \times Ps \times Dn^2}$ 105.38 ✓ %

*If calculating by hand:
1) Convert T_s and T_m to °R
2) Multiply EQ 1 by $530/T_m$(°R) if meter not temperature compensated.
3) $F_m = 2.684 \times 10^{-5} \times F_e$

Data Sheet 6002-4
Revised 2/15/78

HP-67 KEYED CALCULATION SHEET*

PARTICULATE EMISSION CALCULATIONS

Test No. 5/4-2A Date 10/2/79 Location 5, Blr. Out. Engr. Tilman

Unit No. 10 Fuel Hogged Sampling Train and Method Joy, METH 5

Pitot Factor, Fs .837 Barometric Pressure, P_{bar} 30.94 (STO 0) in. Hg

Tot. Liquid Collected, V_{lc} 159.4 (STO 1) ml Total Particulate, M_n 4128.1 (STO 2) m gm

Velocity Head, ΔP 0.334 (STO 3) iwg Stack Temp., Ts 674 (STO 4) °F Stack Area, As 100.0 (STO 5) ft^2

Sample Volume, Vm 37.89 (STO 6) ft^3 Stack Press., Psg -4.0 (STO 7) iwg Excess O_2, XO_2% 7.7 (STO 8) %

Orifice Press. Diff., H 0.161 (STO 9) iwg Stack Gas Sp. Gravity, Gs 0.96 (STO A) n.d.

Sample Time, θ 96 (STO B) min Nozzle Dia., Dn 0.245 (STO C) in. Meter Temp., T_m 109 (STO D) °F

Select F_e	Oil (A)	Gas (B)	Coal (C)	Other:
SC Feet/10^4 Btu	92.2	87.4	98.2	96.6 (D)

Press (E) if meter is not temperature compensated.

1. Sample Gas Volume $Vm_{std} = 0.0334\ Vm(P_{bar} + H/13.6)$ 36.486 ✓ SCF

2. Water Vapor $Vw_{std} = 0.0474\ V_{lc}$ 7.5556 ✓ SCF

3. Moisture Content Bwo = Eq. 2/(Eq. 1 + Eq. 2) 0.1716 ✓ N.D.

4. Concentration a. $C = 0.0154\ Mn/Vm_{std}$ 1.742 grains/DSCF

b. $C = 2.205 \times 10^{-6}\ Mn/Vm_{std}$ .00025 lb/DSCF

c. $C = \text{Eq. 4b} \times 16.018 \times 10^3$ 3.997 grams/DSCM

5. Abs. Stack Press. $Ps = P_{bar} \times 13.6 + Psg$ 416.78 in. w abs.

6. Stack Gas Speed $Vs = 174\ Fs\ \sqrt{\Delta P Ts}\sqrt{\frac{407}{Ps} \times \frac{1.00}{Gs}}$ 2.8348×10^3 ft/min

7. Stack Gas Flow Rate @ 70°F a. $Qsw = \text{Eq. 6} \times As \times \frac{530}{Ts} \times \frac{Ps}{407}$ 135652 WSCF/min

b. Qsd = Eq. 7a x (1. - Eq. 3) 112380 DSCF/min

8. Material Flow Ms = Eq. 7b x Eq. 4b x 60 1682 lb/hr

9. XO_2 factor $XO_2f = 2090/(20.9 - XO_2\%)$ 158.33 N.D.

10. Emission a. E = Eq. 4b x Fe x Eq. 9 3.82 lb/MMBtu

b. E = Eq. 4c x Fm x Eq. 9 x 1000 1641 ng/joule

11. % Isokinetic $I = \frac{14077 \times Ts(Vm_{std} + Vw_{std})}{\theta \times Vs \times Ps \times Dn^2}$ 103.26 %

*If calculating by hand:
1) Convert T_s and T_m to °R
2) Multiply EQ 1 by $530/T_m$(°R) if meter not temperature compensated.
3) $F_m = 2.684 \times 10^{-5} \times F_e$

Data Sheet 6002-4
Revised 2/15/78

HP-67 KEYED CALCULATION SHEET*

PARTICULATE EMISSION CALCULATIONS

Test No. 5/7-2 Date 10-17-79 Location 5 Engr. [illegible]

Unit No. 10 Fuel Wood Sampling Train and Method M5/6.5 CU-2

Pitot Factor, Fs .837 Barometric Pressure, P_{bar} 30.88 (STO 0) in. Hg

Tot. Liquid Collected, V_{1c} 143.5 (STO 1) ml Total Particulate, M_n 5676.4 (STO 2) m gm

Velocity Head, ΔP .22 (STO 3) iwg Stack Temp., Ts 715 (STO 4) °F Stack Area, As 100 (STO 5) ft^2

Sample Volume, Vm 29.3 (STO 6) ft^3 Stack Press., Psg -4.0 (STO 7) iwg Excess O_2, XO_2% 5.1 (STO 8) %

Orifice Press. Diff., H .1004 (STO 9) iwg Stack Gas Sp. Gravity, Gs .96 (STO A) n.d.

Sample Time, θ 96 (STO B) min Nozzle Dia., Dn .245 (STO C) in. Meter Temp., T_m 105 (STO D) °F

Select F_e	Oil (A)	Gas (B)	Coal (C)	Other:
SC Feet/10^4 Btu	92.2	87.4	98.2	96.6 (E)

Press (E) if meter is not temperature compensated.

1. Sample Gas Volume	$Vm_{std} = 0.0334\ Vm(P_{bar} + H/13.6)$	28.355	SCF
2. Water Vapor	$Vw_{std} = 0.0474\ V_{1c}$	6.8019	SCF
3. Moisture Content	Bwo = Eq. 2/(Eq. 1 + Eq. 2)	.1935	N.D.
4. Concentration	a. $C = 0.0154\ Mn/Vm_{std}$	3.0830	grains/DSCF
	b. $C = 2.205 \times 10^{-6}\ Mn/Vm_{std}$	441.48×10^{-6}	lb/DSCF
	c. $C = \text{Eq. 4b} \times 16.018 \times 10^3$	7.0717	grams/DSCM
5. Abs. Stack Press.	$Ps = P_{bar} \times 13.6 + Psg$	415.96	in. w abs.
6. Stack Gas Speed	$Vs = 174\ Fs \sqrt{\Delta P Ts} \sqrt{\frac{407}{Ps} \times \frac{1.00}{Gs}}$	2344.2	ft/min
7. Stack Gas Flow Rate @ 70°F	a. $Qsw = \text{Eq. 6} \times As \times \frac{530}{Ts} \times \frac{Ps}{407}$	108051	WSCF/min
	b. Qsd = Eq. 7a x (1. - Eq. 3)	87145	DSCF/min
8. Material Flow	Ms = Eq. 7b x Eq. 4b x 60	2308.4	lb/hr
9. XO_2 factor	$XO_2f = 2090/(20.9 - XO_2\%)$	132.28	N.D.
10. Emission	a. E = Eq. 4b x Fe x Eq. 9	5.6413	lb/MMBtu
	b. E = Eq. 4c x Fm x Eq. 9 x 1000	2425.8	ng/joule
11. % Isokinetic	$I = \frac{14077 \times Ts(Vm_{std} + Vw_{std})}{\theta \times Vs \times Ps \times Dn^2}$	103.49	%

*If calculating by hand:
1) Convert T_s and T_m to °R
2) Multiply EQ 1 by $530/T_m$(°R) if meter not temperature compensated.
3) $F_m = 2.684 \times 10^{-5} \times F_e$

Data Sheet 6002-4
Revised 2/15/78

HP-67 KEYED CALCULATION SHEET*

PARTICULATE EMISSION CALCULATIONS

Test No. 5/7·2a Date 10·18·79 Location 5 Engr. K.

Unit No. 10 Fuel wood Sampling Train and Method POM low NOx Module 6.6

Pitot Factor, Fs .837 Barometric Pressure, P_{bar} 30.18 (STO 0) in. Hg

Tot. Liquid Collected, V_{1c} 162.5 (STO 1) ml Total Particulate, M_n 4356.2 (STO 2) m gm

Velocity Head, ΔP .23 (STO 3) iwg Stack Temp., Ts 696 (STO 4) °F Stack Area, As 100 (STO 5) ft^2

Sample Volume, Vm 36.75 (STO 6) ft^3 Stack Press., Psg -4.0 (STO 7) iwg Excess O_2, XO_2% 5.1 (STO 8) %

Orifice Press. Diff., H .10 (STO 9) iwg Stack Gas Sp. Gravity, Gs .96 (STO A) n.d.

Sample Time, θ 120 (STO B) min Nozzle Dia., Dn .245 (STO C) in. Meter Temp., T_m 100 (STO D) °F

Select F_e	Oil (A)	Gas (B)	Coal (C)	Other: wood
SC Feet/10^4 Btu	92.2	87.4	98.2	96.6 (D)

Press (E) if meter is not temperature compensated.

1. Sample Gas Volume $Vm_{std} = 0.0334\ Vm(P_{bar} + H/13.6)$ — 35.069 SCF
2. Water Vapor $Vw_{std} = 0.0474\ V_{1c}$ — 7.7025 SCF
3. Moisture Content $Bwo = Eq.\ 2/(Eq.\ 1 + Eq.\ 2)$ — .1801 N.D.
4. Concentration
   - a. $C = 0.0154\ Mn/Vm_{std}$ — 1.9130 grains/DSCF
   - b. $C = 2.205 \times 10^{-6}\ Mn/Vm_{std}$ — 273.94×10^{-6} lb/DSCF
   - c. $C = Eq.\ 4b \times 16.018 \times 10^3$ — 4.3880 grams/DSCM
5. Abs. Stack Press. $Ps = P_{bar} \times 13.6 + Psg$ — 406.45 in. w abs.
6. Stack Gas Speed $Vs = 174\ Fs\ \sqrt{\Delta P Ts}\sqrt{\frac{407}{Ps} \times \frac{1.00}{Gs}}$ — 2405.1 ft/min
7. Stack Gas Flow Rate @ 70°F
   - a. $Qsw = Eq.\ 6 \times As \times \frac{530}{Ts} \times \frac{Ps}{407}$ — 110101 WSCF/min
   - b. $Qsd = Eq.\ 7a \times (1. - Eq.\ 3)$ — 90274 DSCF/min
8. Material Flow $Ms = Eq.\ 7b \times Eq.\ 4b \times 60$ — 1483.8 lb/hr
9. XO_2 factor $XO_2f = 2090/(20.9 - XO_2\%)$ — 132.3 N.D.
10. Emission
    - a. $E = Eq.\ 4b \times Fe \times Eq.\ 9$ — 3.5004 lb/MMBtu
    - b. $E = Eq.\ 4c \times Fm \times Eq.\ 9 \times 1000$ — 1505.2 ng/joule
11. % Isokinetic $I = \frac{14077 \times Ts(Vm_{std} + Vw_{std})}{\theta \times Vs \times Ps \times Dn^2}$ — 98.847 %

*If calculating by hand:
1) Convert T_s and T_m to °R
2) Multiply EQ 1 by $530/T_m$(°R) if meter not temperature compensated.
3) $F_m = 2.684 \times 10^{-5} \times F_e$

Data Sheet 6002-4
Revised 2/15/78

HP-67 KEYED CALCULATION SHEET*

PARTICULATE EMISSION CALCULATIONS

Test No. 5/7-2c Date 10/23/79 Location #5 Boiler #10 Stack Engr. Tidona

Unit No. 10 Fuel Hogged ww Sampling Train and Method 5

Pitot Factor, Fs .837 Barometric Pressure, P_{bar} 29.90 (STO 0) in. Hg

Tot. Liquid Collected, V_{lc} 287 (STO 1) ml Total Particulate, M_n 935.2 (STO 2) m gm

(πr^2) $r = \frac{d}{2}$

Velocity Head, ΔP .34 (STO 3) iwg Stack Temp., Ts 157 (STO 4) °F Stack Area, As 50.3 (STO 5) ft^2

Sample Volume, Vm 38.71 (STO 6) ft^3 Stack Press., Psg .23 (STO 7) iwg Excess O_2, XO_2% 9.0 (STO 8) %

Orifice Press. Diff., H .45 (STO 9) iwg Stack Gas Sp. Gravity, Gs .88 (STO A) n.d.

Sample Time, θ 86 (STO B) min Nozzle Dia., Dn .245 (STO C) in. Meter Temp., T_m 77 (STO D) °F

Select F_e	Oil (A)	Gas (B)	Coal (C)	Other: WooD
SC Feet/10^4 Btu	92.2	87.4	98.2	96.6 (D)

Press (E) if meter is not temperature compensated.

1. Sample Gas Volume $Vm_{std} = 0.0334\ Vm(P_{bar} + H/13.6)$ (R/S) 38.196 SCF
2. Water Vapor $Vw_{std} = 0.0474\ V_{lc}$ 13.604 SCF
3. Moisture Content Bwo = Eq. 2/(Eq. 1 + Eq. 2) 0.2626 N.D.
4. Concentration a. $C = 0.0154\ Mn/Vm_{std}$ 0.1gr/dscf is reg 0.3771 grains/DSCF
   b. $C = 2.205 \times 10^{-6}\ Mn/Vm_{std}$ 53.994×10^{-6} lb/DSCF
   c. $C = \text{Eq. 4b} \times 16.018 \times 10^3$ 0.8649 grams/DSCM
5. Abs. Stack Press. $Ps = P_{bar} \times 13.6 + Psg$ 406.87 in. w abs.
6. Stack Gas Speed $Vs = 174\ Fs \sqrt{\Delta P Ts} \sqrt{\frac{407}{Ps} \times \frac{1.00}{Gs}}$ 2230.2 ft/min
7. Stack Gas Flow Rate @ 70°F a. $Qsw = \text{Eq. 6} \times As \times \frac{530}{Ts} \times \frac{Ps}{407}$ 96314 WSCF/min
   b. Qsd = Eq. 7a x (1. - Eq. 3) 71020 DSCF/min
8. Material Flow Ms = Eq. 7b x Eq. 4b x 60 230.08 lb/hr
9. XO_2 factor $XO_2f = 2090/(20.9 - XO_2\%)$ 175.63 N.D.
10. Emission a. E = Eq. 4b x Fe x Eq. 9 0.9161 lb/MMBtu
    b. E = Eq. 4c x Fm x Eq. 9 x 1000 393.90 ng/joule
11. % Isokinetic $I = \frac{14077 \times Ts(Vm_{std} + Vw_{std})}{\theta \times Vs \times Ps \times Dn^2}$ 96.050%

*If calculating by hand:
1) Convert T_s and T_m to °R
2) Multiply EQ 1 by $530/T_m$(°R) if meter not temperature compensated.
3) $F_m = 2.684 \times 10^{-5} \times F_e$

Data Sheet 6002-4
Revised 2/15/78

PARTICULATE EMISSION CALCULATIONS

Test No. 5/7-2C Date 10-23-79 Location 5, BlrOut. Engr. TiDona

Unit No. #10 Fuel HOGGED Sampling Train and Method 5

Pitot Factor, Fs .837 Barometric Pressure, P_{bar} 29.90 (STO 0) in. Hg

Tot. Liquid Collected, V_{1c} 153 (STO 1) ml Total Particulate, M_n 596.06 (STO 2) m gm

Velocity Head, ΔP .30 (STO 3) iwg Stack Temp., Ts 655 (STO 4) °F Stack Area, As 100 (STO 5) ft^2

Sample Volume, Vm 32.69 (STO 6) ft^3 Stack Press., Psg -4 (STO 7) iwg Excess O_2, XO_2% 6.2 (STO 8) %

Orifice Press. Diff., ΔH .23 (STO 9) iwg Stack Gas Sp. Gravity, Gs 0.96 (STO A) n.d.

Sample Time, θ 96 (STO B) min Nozzle Dia., Dn .245 (STO C) in. Meter Temp., T_m 99 (STO D) °F

Select F_e	Oil (A)	Gas (B)	Coal (C)	Other: WooD
SC Feet/10^4 Btu	92.2	87.4	98.2	96.6 (D)

Press (E) if meter is not temperature compensated.

68
75.42

1. Sample Gas Volume		$Vm_{std} = 0.0334\ Vm(P_{bar} + \Delta H/13.6)$	30.970	SCF	30.97
2. Water Vapor		$Vw_{std} = 0.0474\ V_{1c}$	7.2522	SCF	11.43
3. Moisture Content		Bwo = Eq. 2/(Eq. 1 + Eq. 2)	0.1897	N.D.	27)
4. Concentration	a.	$C = 0.0154\ Mn/Vm_{std}$	2.9639	grains/DSCF	
	b.	$C = 2.205 \times 10^{-6}\ Mn/Vm_{std}$	424.44×10^{-6}	lb/DSCF	
	c.	$C = \text{Eq. 4b} \times 16.018 \times 10^3$	6.7986	grams/DSCM	
5. Abs. Stack Press.		$Ps = P_{bar} \times 13.6 + Psg$	402.64	in. w abs.	
6. Stack Gas Speed		$Vs = 174\ Fs \sqrt{\Delta P Ts} \sqrt{\frac{407}{Ps} \times \frac{1.00}{Gs}}$	2710.40	ft/min	
7. Stack Gas Flow Rate @ 70°F	a.	$Qsw = \text{Eq. 6} \times As \times \frac{530}{Ts} \times \frac{Ps}{407}$	127434	WSCF/min	
	b.	Qsd = Eq. 7a x (1. - Eq. 3)	103255	DSCF/min	
8. Material Flow		Ms = Eq. 7b x Eq. 4b x 60	2629.5	lb/hr	
9. XO_2 factor		$XO_2f = 2090/(20.9 - XO_2\%)$	142.18	N.D.	
10. Emission	a.	E = Eq. 4b x Fe x Eq. 9	5.8293	lb/MMBtu	
	b.	E = Eq. 4c x Fm x Eq. 9 x 1000	2506.6	ng/joule	
11. % Isokinetic		$I = \frac{14077 \times Ts(Vm_{std} + Vw_{std})}{\theta \times Vs \times Ps \times Dn^2}$	95.400	%	

*If calculating by hand:
1) Convert T_s and T_m to °R
2) Multiply EQ 1 by 530/T_m(°R) if meter not temperature compensated.
3) $F_m = 2.684 \times 10^{-5} \times F_e$

Data Sheet 6002-4
Revised 2/15/78

PARTICULATE CALCULATION SHEET

Test No. 5/1-1 (Inlet, Outlet)
Box No. CU-3
Test Description:

Location #5 Boiler Out
Test Date 9/17/79

Dry Gas Meter Vol (ft3)
Final
Initial
Total

Impinger Water Vol (ml)

	1	2	3	Total
Final	295	105	2	214
Initial	100	100	0	200
△ Vol	195	5	2	141

							Filter No.	~~Filter~~ 9/14 No.
Beaker No.		#31	#53	A		B	#102 9/12	#6
Date Weighed		9/12/79	9/12/79	9/14/79		9/14/79	.7792 .7791	.7523
Tare Wt.	1	103.9747	102.3117	100.6748		100.8361	.7791	.7524
	2	103.9748	102.3119	100.6746		100.8360	avg. .7791	.7524
	3	103.9746	102.3116	100.6746		100.8363		avg. .7524
	4						#103 9/14	
	5						.7714	
	6						.7715	
	Avg	103.9747	102.3117	100.6747		100.8361	.7713	
Bottle No.							avg. .7714	
Content		Impinger (Water)	Probe (Acetone)	Probe (Water)	~~Cyclone (Acetone)~~	~~Flask~~ (Dry)		
Rinse (ml)		510	650	325				
Date Weighed or 250 Bake)		9/18/79	9/18/79	9/18/79		9/18/79	#102 9/18 1.2886	#6 9/18/79
Final Wt. 250	1	104.0802	102.6852	100.7613		106.3671	1.2888	0.9252
	2	104.0805	102.6852	100.7612		106.3670	1.2889	0.9254
	3	104.0805	102.6854	100.7611		106.3671	avg. 1.2888	0.9252
	4						#103 9/18	avg 0.9253
	5						1.0102	
	6						1.0102	
	Avg	104.0804	102.6853	100.7612		106.3672	1.0103	
Residue Wt Final 250 Tare)		0.1057	0.3736	0.0864		5.5311	avg 1.0102 All filters	residue = .9214
Date Weighed or 650 Bake)								
Final Wt. 650	1							
	2							
	3							
	4							
	5							
	6							
	Avg							
Residue Wt. Final 650 Tare)								

Comments:

8830-5

PARTICULATE CALCULATION SHEET

Test No. 5/2-1b (Inlet, Outlet)
Location #5
Box No.
Test Date 9/20/79
Test Description:

Dry Gas Meter Vol (ft3)
Final
Initial
Total

Impinger Water Vol (ml)

	1	2	3	Total	
Final	245	112	1	2045	
Initial	100	100	0	200	
△ Vol	145	12	1	45	162.5

							Filter No.	Blank No.
Beaker No.		C	12	13		15	#104	
Date Weighed		9/14	9/14	9/14		9/14	9/14	
Tare Wt.	1	101.6395	100.9659	103.3642		101.4085	.7912	
	2	101.6397	100.9662	103.3640		101.4087	.7911	
	3	101.6395	100.9660	103.3641		101.4087	.7910	
	4							
	5							
	6							
	Avg	101.6396	100.9660	103.3647		101.4086	.7911	
Bottle No.								
Content		Impinger (Water)	Probe (Acetone)	Probe (Water)	~~Cyclone~~ (~~Acetone~~)	Flask (Dry)		
Rinse (ml)		350ml	675ml	385ml				
Date Weighed or 250 Bake)		9/23	9/23	9/23		9/23	9/27	
Final Wt. 250	1	101.6965	101.5980	103.4140		104.7718	1.7077	
	2	101.6967	101.5982	103.4141		104.7719	1.7077	
	3	101.6963	101.5982	103.4140		104.7721	1.7074	
	4							
	5							
	6							
	Avg	101.6965	101.5981	103.4140		104.7719	1.7076	
Residue Wt Final 250 Tare)		0.0569 −blank 0.0550	0.6321 −blank 0.6243	0.0493 −blank 0.0472		3.3633	0.9165	
Date Weighed or 650 Bake)								
Final Wt. 650	1							
	2							
	3							
	4							
	5							
	6							
	Avg							
Residue Wt. Final 650 Tare)								

Comments:

8830-5

PARTICULATE CALCULATION SHEET

Test No. 5-2-1C (#10 Boiler ~~[illegible]~~, Outlet)
Box No. CU-3
Test Description:

Location #5, #10 Boiler In-let
Test Date 9/24/79

Dry Gas Meter Vol (ft3)
Final 1300.25
Initial 1257.90
Total 42.35

Impinger Water Vol (ml)

	1	2	3	Total	
Final	292	116	0	208	
Initial	100	100	0	200	
ml Δ Vol	192	16	0	8.5	216.5

							Filter No. 3	Blank No.
		[illegible]	[illegible] 175	[illegible] 150				
Beaker No.		A	#2	#7		#31		
Date Weighed		9/24/79	9/24	9/24		9/24	9/12/79	
Tare Wt.	1	100.6767	100.6063	104.0031		103.9747	.7451	
	2	100.6763	100.6061	104.0033		103.9744	.7453	
	3	100.6764	100.6061	104.0033		103.9748	.7451	
	4							
	5							
	6							
	Avg	100.6764	100.6062	104.0032		103.9746	.7452	
Bottle No.								
Content		Impinger (Water)	Probe (Acetone)	Probe (Water)	~~Cyclone~~ (~~Acetone~~)	Flask (Dry)		
Rinse (ml)		390	775	350				
te Weighed or 250 Bake)		9/27	9/27	9/27		9/27	9/27	
Final Wt. 250	1	100.8306	101.2093	104.0840		109.9167	1.8183	
	2	100.8304	101.2096	104.0839		109.9163	1.8185	
	3	100.8307	101.2097	104.0839		109.9165	1.8186	
	4							
	5							
	6							
	Avg	100.8305	101.2095	104.0839		109.9165	1.8185	
Residue Wt Final 250 Tare)		0.1541 -blank 0.1520	0.6033 -blank 0.5944	0.0807 -blank 0.0788		5.9419	1.0733	
Date Weighed or 650 Bake)								
Final Wt. 650	1							
	2							
	3							
	4							
	5							
	6							
	Avg							
Residue Wt. Final 650 Tare)								

Comments:

PARTICULATE CALCULATION SHEET

Test No. 5-2-1C (Inlet, Outlet)
Location #5 Multiclone Out
Box No. CU-2
Test Date 9/24/79
Test Description: Multiclone efficiency

Dry Gas Meter Vol (ft3)
Final 7191.40
Initial 7154.08
Total 37.32

Impinger Water Vol (ml)

	1	2	3	Total
Final	217	116	1	2075
Initial	100	100	0	200
△ Vol	117	16	1	25.1415

							Filter No.	Blank No.
		200 125	200 200 200 200	200 25				
Beaker No.		#9	#10	#11		#16	105	
Date Weighed		9/24/79	9/24	9/24		9/24	9/24	
Tare Wt.	1	100.1828	100.9345	100.8330		98.7079	.7789	
	2	100.1828	100.9346	100.8332		98.7078	.7788	
	3	100.1830	100.9344	100.8331		98.7080	.7790	
	4							
	5							
	6							
	Avg	100.1829	100.9345	100.8331		98.7078	.7789	
Bottle No.								
Content		Impinger (Water)	Probe (Acetone)	Probe (Water)	~~Cyclone~~ (~~[illegible]~~)	Flask (Dry)		
Rinse (ml)		325	800	225				
Date (Weighed or 250 Bake)			9/27	9/27		9/27	9/27	
Final Wt. 250	1	100.3393	101.7958	100.9186		99.2683	1.8725	
	2	100.3393	101.7958	100.9190		99.2684	1.8727	
	3	100.3393	101.7959	100.9189		99.2685	1.8728	
	4							
	5							
	6							
	Avg	100.3393	101.7958	100.9188		99.2684	1.8727	
Residue Wt (Final 250 Tare)		.1564 - blank .1546	.8613 - blank .8521	.0857 - blank .0845		.5606	1.0955	
Date (Weighed or 650 Bake)								
Final Wt. 650	1							
	2							
	3							
	4							
	5							
	6							
	Avg							
Residue Wt. (Final 650 Tare)								

Comments:

8830-5

POM

PARTICULATE CALCULATION SHEET

Test No. 5-2-1e (Inlet, Boiler Outlet) Location #5 Boiler Jut #
Box No. CU-2 Test Date 9/26/79
Test Description: POM

Dry Gas Meter Vol (ft3)
Final
Initial
Total

Impinger Water Vol (ml)

	1	2	3	Total
Final	350	194	0	209
Initial	100	100	0	200
△ Vol	250	34	0	9

Tot. = 293 m

							Filter No.	[illegible] No.
		150 135 200 100 125	120 104 200 25 135					
Beaker No.		B	C		A	#4	#108	#109
Date Weighed		9/26	9/26		9/26	9/26	9/26	9/26
Tare Wt.	1	98.5688	101.6388		100.6740	100.7863	.7825	.7913
	2	98.5689	101.6390		100.6738	100.7862	.7825	.7911
	3	98.5687	101.6387		100.6739	100.7863	.7824	.7911
	4							
	5							
	6							
	Avg	98.5688	101.6388		100.6739	101.7863	.7825	.7912
Bottle No.					50/50 Blank			
Content		Impinger (Water)	Probe (~~[illegible]~~ 50/50)	~~[illegible]~~ (~~[illegible]~~)	~~[illegible]~~ (~~[illegible]~~)	Flask (Dry)		
Rinse (ml)		740	50/50 755		100 ml			
te Weighed or 250 Bake)		10/2/79	10/2/79		10/2	9/27/79	10/1	10/1
Final Wt. 250	1	98.6939	103.3610		100.6762	103.0797	.7836	1.8027
	2	98.6940	103.3609		100.6767	103.0797	.7537	1.8028
	3	98.6938	103.3612		100.6765	103.0800	.7834	1.8027
	4							
	5							
	6							
	Avg	98.6939	103.3610		100.6765	103.0798	.7836	1.8027
Residue Wt Final 250 Tare)		0.1251 -blank .1210	1.7222		.0026	1.2935	0.0011	1.0115
Date Weighed or 650 Bake)								
Final Wt. 650	1							
	2							
	3							
	4							
	5							
	6							
	Avg							
Residue Wt. Final 650 Tare)								

Comments:

PARTICULATE CALCULATION SHEET

Test No. 5/2-9A (~~Inlet~~, Boiler Outlet)
Box No. CU-2
Test Description:

Location #5 Boiler Out
Test Date 10/3/79

Dry Gas Meter Vol (ft3)
Final
Initial
Total

Impinger Water Vol (ml)

	1	2	3	Total	
Final	265	107	0	205	
Initial	100	100	0	200	
△ Vol	165	7		5	177

							Filter No.	Blank No.
		200 100 100	200 100 75	200 100				
Beaker No.		11	14	15		16	110	
Date Weighed		10/2	10/2	10/2		10/2	10/1	
Tare Wt.	1	100.8323	100.0749	103.7915		98.7072	0.7831	
	2	100.8324	100.0748	103.7913		98.7071	0.7829	
	3	100.8324	100.0747	103.7914		98.7069	0.7830	
	4							
	5							
	6							
	Avg	100.8324	100.0748	103.7914		98.7071	0.7830	
Bottle No.								
Content		Impinger (Water)	Probe (Acetone)	Probe (Water)	Cyclone (Acetone)	Flask (Dry)		
Rinse (ml)		400	425	300				
Site Weighed or 250 Bake)		10/8	10/8	10/8		10/8	10/8	
Final Wt. 250	1	100.8558	100.3354	103.8510		107.7564	1.7418	
	2	100.8556	100.3353	103.8510		107.7568	1.7420	
	3	100.8554	100.3354	103.8510		107.7569	1.7421	
	4							
	5							
	6							
	Avg	100.8556	100.3354	103.8510		107.7567	1.7420	
Residue Wt Final 250 Tare)		0.0232 ✓	0.2606 ✓	0.0596 ✓		9.0496 ✓	0.9590 ✓	
Date Weighed or 650 Bake)								
Final Wt. 650	1							
	2							
	3							
	4							
	5							
	6							
	Avg							
Residue Wt. Final 650 Tare)								

Comments:

.02320
.2606
.0596
9.0496
.9590
-.0039 H₂O Bl.
-.0049 Ac. Bl.
10.3432 ✓

PARTICULATE CALCULATION SHEET

Test No. 5/4-2A Date 10/2/79 Location 5, Boiler Out. Test Crew

Box No. Sample Probe Position

Test Description

Dry Gas Meter Vol. (ft³)

Final

Initial

Total

Impinger Water Vol (ml)

	1	2	3	S. Gel	Total
Final	245	106	0	208.4	
Initial	100	100	0	200.0	
Δ Vol	145	6	0	8.4	159.4

							Filter No. 111	Blank No.
Beaker No.		200 150 [illegible] #9	200 200 50 #10	200 188 188 #12		#13		
Date Weighed		10/1	10/1	10/1		10/1	10/1	
Tare Wt.	1	100.1813	100.9343	100.9673		102.3123	.7795	
	2	100.18113	100.9345	100.9678		102.3125	.7796	
	3	100.1814	100.9338	100.9672		102.3122	.7793	
	4							
	5							
	6							
	Avg	100.1813	100.9345	100.9673		102.3123	.7795	
Bottle No.								
Content		Impinger (Water)	Probe (Acetone)	Probe (Water)	[illegible] ([illegible]e)	Flask (Dry)		
Rinse (ml)		550	450	400				
Date Weighed or 250 Bake		10/8	10/4	10/8		10/4	10/4	
Final Wt. 250	1	100.1905	101.1936	101.0833		105.3661	1.4800	
	2	100.1902	101.1936	101.0833		105.3662	1.4802	
	3	100.1900	101.1936	101.0834		105.3664	1.4801	
	4							
	5							
	6							
	Avg	100.1902	101.1936	101.0833		105.3662	1.4801	
Residue wt Final 250-Tare		0.0089✓	0.2591✓	0.1160✓		3.0539✓	0.7006✓	
Date Weighed or 650 Bake								
Final Wt. 650	1							
	2							
	3							
	4							
	5							
	6							
	Avg							
Residue Wt Final 650-Tare								

Comments:

.0089
.2591
.1160
3.0539
.7006
- .0052 H₂O BL.
- .0052 Ac. BL
4.1281 ✓

Data Sheet 6002-3

PARTICULATE CALCULATION SHEET

Test No. 5/7-2 (~~Inlet~~ Boiler, Outlet)
Box No. CU-2
Test Description:

Location #5 No. 10 Boiler Out
Test Date 10/17/79

Dry Gas Meter Vol (ft3)
Final 7347.35
Initial 7318.05
Total 29.30

Impinger Water Vol (ml)

	1	2	3	4 Total
Final	230	106	0	207.5
Initial	100	100	0	200.0
△ Vol	130	6	0	7.5

143.5

200
130 — 5
200
175 — 200
125

							Filter No.	Blank No.
Beaker No.		B	C	#2		#4	#112	
Date Weighed						10/9	10/1/79	
Tare Wt.	1	98.5702	101.6408	100.6054		100.7904	.7882	
	2	98.5700	101.6405	100.6053		100.7903	.7880	
	3	98.5699	101.6403	100.6052		100.7900	.7880	
	4							
	5							
	6							
	Avg	98.5700	101.6405	100.6053		100.7902		
Bottle No.							.7881	
Content		Impinger (Water)	Probe (Acetone)	Probe (Water)	~~Cyclone~~ (~~Acetone~~)	Flask (Dry)		
Rinse (ml)		330 ml	430 ml	325 ml				
Date Weighed or 250 Bake)		10/24	10/24	10/24		10/24	10/21/79	
Final Wt. 250	1	98.5910	101.9387	100.6660		105.2876	1.5960	
	2	98.5908	101.9385	100.6656		105.2878	1.5962	
	3	98.5907	101.9384	100.6656		105.2880	1.5963	
	4							
	5							
	6							
	Avg	98.5908	101.9385	100.6657		105.2878	1.5962	
Residue Wt Final 250 Tare)								
Date Weighed or 650 Bake)								
Final Wt. 650	1							
	2							
	3							
	4							
	5							
	6							
	Avg							
Residue Wt. Final 650 Tare)		.0208	.2980	.0604		4.4976	.8081	

Comments:

PARTICULATE CALCULATION SHEET

Test No. 5/7-2A (Inlet, Outlet)
Location 5
Box No.
Test Date 10-18-79
Test Description: Port Test Module 356
Low NOx condition

Dry Gas Meter Vol (ft3)
Final 7784.10
Initial 7747.35
Total 36.75

Impinger Water Vol (ml)

	1	2	3	4/Total
Final	245	110	1	206.5
Initial	100	100	0	209
Δ Vol	145	10	1	

162.5

138
100
90

110
125
200
50/50

							Filter No.	Blank No.
Beaker No.		#5	#7			#8	113	
Date Weighed		10/9/79	10/9/79			10/9/79	10/1	
Tare Wt.	1	99.9126	104.0032			98.9158	.7680	
	2	99.9121	104.0031			98.9156	.7681	
	3	99.9121	104.0028			98.9158	.7678	
	4							
	5							
	6							
	Avg	99.9123	104.0030			98.9157	.7680	
Bottle No.								
Content		Impinger (Water)	50/50 ~~Probe~~ (~~Acetone~~)	~~Probe~~ (~~Water~~)	~~Cyclone~~ (~~Acetone~~)	Flask (Dry)		
Rinse (ml)		370 ml.	435 ml					
Date Weighed or 250 Bake)		10/24	10/24			10/24	10/21/79	
Final Wt. 250	1	99.9490	105.3568			101.0058	1.6570	
	2	99.9489	105.3567			101.0056	1.6569	
	3	99.9488	105.3567			101.0061	1.6574	
	4							
	5							
	6							
	Avg	99.9489	105.3567			101.0058	1.6571	
Residue Wt Final 250 Tare)								
Date Weighed or 650 Bake)								
Final Wt. 650	1							
	2							
	3							
	4							
	5							
	6							
	Avg							
Residue Wt. Final 650 Tare)		.0366	1.3537			2.0901	0.8891	

Comments:

4.3562

8830-5

PARTICULATE CALCULATION SHEET

Test No. 5/7-2C D.C & Scrubber (~~Inlet~~, Outlet)
Location #5 Unit #10 - D.C Scrubber Out
Box No.
Test Date 10/23/79
Test Description:

Dry Gas Meter Vol (ft3)
Final 1511.06
Initial 1472.35
Total 38.71

Impinger Water Vol (ml)

	1	2	3	4 Total
Final	341	134	2	210
Initial	100	100	0	200^{5}
△ Vol	241	34	2	10^{5}

							Filter No.	Blank No.
Beaker No.		#9	#10	#30		31	#5	
Date Weighed		10/24/79	10/24/79	10/25/79		10/9/79	10/9/79	
Tare Wt.	1	100.1827	100.5759	103.1125		103.9747	0.7547	
	2	100.1825	100.8759	103.1124		103.9747	0.7548	
	3	100.1824	100.8757	103.1123		103.9747	0.7547	
	4							
	5							
	6							
	Avg	100.1825	100.8758	103.1124		103.9747	0.7547	
Bottle No.								
Content		Impinger (Water)	Probe (Acetone)	Probe (Water)	~~Cyclone~~ (~~Acetone~~)	Flask (Dry)		
Rinse (ml)		460	620	380	840			
Date Weighed or 250 Bake)		10/26/79	10/26/79	10/26/79		10/26/79	10/26/79	
Final Wt. 250	1	100.2225	101.0656	103.2070		103.9767	1.3744	
	2	100.2221	101.0654	103.2069		103.9766	1.3743	
	3	100.2220	101.0653	103.2069		103.9766	1.3746	
	4							
	5							
	6							
	Avg	100.2222	101.0654	103.2069		103.9766	1.3744	
Residue Wt Final 250 Tare)		0.0397	0.1896	0.0945		0.0019	0.6197	
Date Weighed or 650 Bake)								
Final Wt. 650	1							
	2							
	3							
	4							
	5							
	6							
	Avg							
Residue Wt. Final 650 Tare)								

Comments: New Acetone Lot # WD5P

.9352

39

8830-5

PARTICULATE CALCULATION SHEET

Test No. 5/7-2C (~~Inlet~~, BLR Outlet)
Box No. ______
Test Description: ______
Location ______
Test Date 10-23-79

Dry Gas Meter Vol (ft3)
Final 7417.04
Initial 7384.35
Total 32.69

Impinger Water Vol (ml)

	1	2	3	4 Total	
Final	290	56	0	202	
Initial	100	100	0	200	
△ Vol	190	-44	0	2.2	

153

				Blank Acetone			
						Filter No.	**Blank No.**
Beaker No.	11	12	13	14	15	114	
Date Weighed	10/9	10/9	10/9	10/9	10/9	10/1	
Tare Wt. 1	100.8356	100.9619	102.3127	100.0758	103.7912	.7862	
2	100.8353	100.9619	102.3124	100.0758	103.7911	.7860	
3	100.8352	100.9618	102.3122	100.0757	103.7911	.7860	
4							
5							
6							
Avg	100.8354	100.9619	102.3124	100.0758	103.7911	.7861	
Bottle No.	200 ml 140 100	200 ml [illegible] 175	200 ml 100 193	100 ml			
Content	Impinger (Water)	Probe (Acetone)	Probe (Water)	~~[illegible]~~ (~~[illegible]~~)	Flask (Dry)		
Rinse (ml)	440	575	445	100			
Date Weighed or 250 Bake)	10/26/79	10/26/79	10/26/79	10/26/79	10/26/79	10/26/79	
Final Wt. 250 1	100.8450	101.4941	102.4004	100.0767	108.3146	1.6034	
2	100.8448	101.4941	102.4002	100.0767	108.3147	1.6035	
3	100.8445	101.4941	102.4002	100.0767	108.3150	1.6035	
4							
5							
6							
Avg	100.8448	101.4941	102.4003	100.0767	108.3148	1.6035	
Residue Wt Final 250 Tare)	0.0094	0.5322	0.0879	0.0009	4.5237	0.8174	
Date Weighed or 650 Bake)							
Final Wt. 650 1							
2							
3							
4							
5							
6							
Avg							
Residue Wt. Final 650 Tare)							

Comments: Acetone New Lot # WDSF

5.9606

KVB

Test No. 5-1-1

Engr. TIDONA, GABRIEL, FRONOFF

STACK DATA

Date 9/17/79 Location #5 Boiler Out Unit No. 10 Fuel HOGGED + #6 OIL

Load 230 K#/hr or MBtu/hr ______ Filter No. #102 & #6

Sample Box No. ______ Meter Box No. CU3 Probe No. ______ Probe Length 6'

Stack Moisture ______ %

Ambient Temperature ______ °F

Nozzle Diameter ______ in.

Atmospheric Pressure 30.77 in.Hg

Stack Gas Pressure, Ps -.50 iwg

Stack Area, As 100 ft^2

Remarks:

Final Meter: 1188.23

Initial Meter: 1157.35

30.88
− .22
30.66

	6 min points Time	Vm (CF)	Vacuum (in. Hg)	ΔP (iwg)	ΔH (iwg)	T_s (°F)	$T_{imp.}$ ~~in~~ OUT (°F)	$T_{imp.}$ ~~out~~ IN (°F)	T_{filter} (°F)	T_m (°F)
1		1159.24	2.6	.16	.15	600	70	160	250	110/100
2		1162.29	6.8	.53	.50	610	70	170	260	115/110
3		1164.74	6.0	.41	.38	600	70	170	310	115/120
4		1166.56	5.0	.16	.15	610	70	175	310	115/120
NEW FILTER 9 min 5		1170.58	4.5	.46	.43	610	70	160	300	115/115
6		1173.58	7-9	.49	.46	615	68	175	280	115/115
7		1176.29	8.0	.41	.38	610	68	175	240	110/115
8		1179.04	9.0	.42	.40	610	67	220	250	120/115
1181.40 9		1181.18	4.0	.26	.24	610	70	220	250	120/115
10	middle	1184.30	5.0	.35	.39	615	75	260	245	115/115
11	3rd	1186.34	3.0	.28	.26	615	75	260	250	115/112
12	1st	1188.23	6.0	.21	.20	615	75	260	250	115/115
13			TRAIN PLUGGED - CONDITIONS CHANGED							
14										
15										
16										
17										
18		Tot. Vol.								
19		=30.66 ft^3								
20										
21										
22										
23										
24										
	TOTAL	30.66								
	AVER.			0.33	0.35	610				114

KVB DS 60-13
Rev. 5/79

KVB

Test No. 5-2-18

Engr. ______________

STACK DATA

Date 9/20/79 Location 5-BOILER OUT Unit No. 10 Fuel HOGGED WOOD

Load ______ K#/hr or MBtu/hr ______ Filter No. #104

Sample Box No. ______ Meter Box No. CU-2 Probe No. ______ Probe Length 4 FT.

Stack Moisture 20 %

Ambient Temperature ______ °F

Nozzle Diameter ______ in.

Atmospheric Pressure 30.66 in.Hg

Stack Gas Pressure, Ps -4.7 iwg

Stack Area, As ______ ft^2

Remarks:

Final Meter: 7154.06

Initial Meter: 7115.70

	4 MIN. PER POINT Time	Vm (CF)	Vacuum (in. Hg)	ΔP (iwg)	ΔH (iwg)	T_s (°F)	$T_{imp.in}$ (°F)	$T_{imp.out}$ (°F)	T_{filter} (°F)	T_m (°F)
1		7118.65	4	.76	.35	695	70	265	400	125/115
2		7120.78	4	.72	.31	685	70	265	410	125/115
3		7122.15	3	.22	.11	650	70	170	410	125/115
4		7124.31	5	.63	.20	680	70	215	350	135/120
5		7125.55	3.5	.33	.11	687	70	230	370	130/120
6		7126.42	2.0	.10	.05	700	70	230	350	125/115
7		7128.42	5	.52	.25	730	70	200	320	130/120
8		7129.98	3.8	.33	.16	703	70	230	350	130/120
9		7131.76	5.0	.41	.19	685	70	240	370	130/120
10		7133.54	5	.43	.20	670	70	170	320	130/120
11		7135.04	5	.31	.14	666	70	230	370	130/120
12		7136.62	5	.34	.16	670	72	240	370	130/120
13		7138.12	5	.31	.14	660	72	240	380	130/120
14		7139.40	3.9	.21	.10	658	72	230	380	130/120
15		7140.46	4	.16	.07	663	70	240	380	130/120
16		7141.72	2	.23	.10	670	70	240	360	120/120
17		7143.23	4	.31	.14	660	69	250	360	130/120
18		7144.29	5	.14	.07	670	68	230	370	130/120
19		7146.80	5.5	.32	.15	658	68	230	370	130/120
20		7148.24	6.2	.37	.17	666	68	235	375	130/120
21		7149.22	4.5	.13	.06	665	70	200	385	130/122
22		7151.55	9	.77	.35	646	65	260	360	130/120
23		7153.09	4	.33	.15	637	68	240	380	130/120
24		7154.06	3.8	.13	.06	640	69	220	380	130/120
	TOTAL	38.36								
	AVER.			0.35	0.162	671				124

KVB DS 60-13

Rev. 5/79

KVB

Test No. 5/2-1C
Engr. TIDONA

STACK DATA

Date 9/24/79 Location 5-BLR.OUT Unit No. 10 Fuel HOGGED
Load ______ K#/hr or MBtu/hr ______ Filter No. 3
Sample Box No. ______ Meter Box No. CU3 Probe No. 4' Probe Length ______
Stack Moisture 20.0 %
Ambient Temperature ______ °F
Nozzle Diameter .372 in.
Atmospheric Pressure 30.75 in.Hg
Stack Gas Pressure, Ps -3.5 iwg
Stack Area, As ______ ft^2

Remarks:
Final Meter: 1300.98
Initial Meter: 1257.90

4 min per point Time	Vm (CF)	Vacuum (in. Hg)	ΔP (iwg)	ΔH (iwg)	T_s (°F)	$T_{imp.in}$ (°F)	$T_{imp.out}$ (°F)	T_{filter} (°F)	T_m (°F)
1	1259.31	2.5	.44	.46	660	215	70	300	87
2	1261.11	2.5	.48	.48	660	240	70	310	90
3	1262.65	2.0	.31	.36	625	200	70	290	90
4	1264.39	2.0	.35	.40	650	210	70	250	100
5	1266.16	2.4	.35	.35	625	230	70	290	100
6	1267.61	2.5	.27	.33	640	240	80	310	110
7	1269.20	3.0	.29	.34	630	230	80	300	110
8	1271.68	3.0	.28	.33	630	250	75	320	110
9	1273.32	3.0	.24	.31	630	250	80	320	110
10	1274.46	3.0	.25	.31	610	220	80	290	110
11	1276.16	3.5	.29	.34	620	220	80	310	110
12	1277.42	3.0	.20	.26	610	180	80	230	110
13	1279.18	3.5	.26	.32	615	220	70	250	110
14	1281.76	4.0	.31	.36	610	220	70	290	110
15	1282.73	4.5	.38	.42	630	220	70	310	110
16	1284.45	4.3	.29	.36	650	250	68	310	105
17	1286.64	4.8	.37	.42	640	220	70	310	105
18	1288.01	5.8	.42	.47	660	220	71	310	105
19	1291.00	6.0	.42	.39	650	220	70	310	100
20	1293.19	6.0	.52	.52	670	200	70	290	100
21	1294.92	5.4	.45	.41	670	320	70	290	100
22	1296.74	6.0	.52	.47	685	170	70	270	100
23	1298.38	6.0	.50	.45	670	200	70	280	100
24	1300.25	6.0	.45	.41	670	200	70	220	100
TOTAL	43.08								
AVER.			0.36	0.386	643				103

KVB DS 60-13
Rev. 5/79

KVB

Test No. 5-2-1C

Engr. ______

STACK DATA

Date 9-24-79 Location #5 MULTICLONE Unit No. 10 Fuel Hogged Wood

Load ______ K#/hr or MBtu/hr OUT. Filter No. 105

Sample Box No. ______ Meter Box No. CU2 Probe No. ______ Probe Length 6 ft.

Stack Moisture 20 %

Ambient Temperature ______ °F

Nozzle Diameter .372 in.

Atmospheric Pressure 30.75 in.Hg

Stack Gas Pressure, Ps -1.40 iwg

Stack Area, As 5.57'X ft²

Remarks:

Final Meter: 7191.40

Initial Meter: 7154.08

TEST PTS. @ 17" & 38" from NEAR WALL

	7 min Points Time	VACUUM in [redacted] Hg	C.F. [redacted]	ΔP (iwg)	ΔH (iwg)	T_s (°F)	$T_{imp.in}$ (°F)	$T_{imp.out}$ (°F)	T_{filter} (°F)	T_m (°F)
PART #1 - 1.	1535	2.5	7158.09	.09	.26	450	70	80	260	90/90
2.		4.0	7161.32	.08	.23	450	65	140	270	100/100
3.		5.8	7165.33	.12	.35	448	70	170	275	100/100
3 - 4.		6.0	7168.53	.09	.26	448	66	210	340	110/105
5.		5.3	7172.11	.07	.20	450	68	150	240	110/105
5 - 6.		5.4	7175.04	.06	.17	450	65	195	250	115/105
7.		9.0	7179.09	.14	.41	452	69	160	210	118/110
7 - 8.		8.2	7183.00	.10	.29	456	68	190	240	118/110
9.		8.3	7187.91	.12	.35	452	70	140	210	120/115
9 - 10.		7.9	7191.40	.08	.23	452	66	180	260	120/115
	TOTAL	37.32								
	AVER.			0.095	0.275	451				103

KVB DS 60-13

Rev. 5/79

KVB

Test No. 5/2-1E
Engr. TIDONA

POM COIL 357

STACK DATA

Date 9/26/79 Location 5 Unit No. 10 Fuel HOGGED WOOD
Load 160 K#/hr or MBtu/hr ______ Filter No. 108 + 109
Sample Box No. ______ Meter Box No. CU-2 Probe No. ______ Probe Length 4'
Port #3
Stack Moisture 20 %
Ambient Temperature ______ °F
Nozzle Diameter 0.245 in.
Atmospheric Pressure 30.74 in.Hg
Stack Gas Pressure, Ps -4.0 iwg
Stack Area, As ______ ft^2

Remarks:
Final Meter: 7240.88
Initial Meter: 0 1st 7191.49 / 7195.38 6
7197.58 (3) st new test

K-39-stop test

Time	Vm (CF)	Vacuum (in. Hg)	ΔP (iwg)	ΔH (iwg)	T_s (°F)	$T_{imp.in}$ (°F)	$T_{imp.out}$ (°F)	T_{filter} (°F)	T_m out (°F)
1631	—	-8.0		.185	671	81	67	305	90
		TRAIN PLUGGED - RESTART METER 7197.58 AT							1748
1800	7202.33	-7.5	.35	.15	711	N.A.	59	350	98
1808	7205.52	-7.8	.35	.15	708	—	56	350	100
1815	7208.31	-8.0	.35	.15	697	—	57	285	101
1828	7213.39	-8.4	.35	.15	702	—	59	380	107
1838	7217.27	-8.6	.35	.15	690	—	59	300	109
1850	7222.83	-9.2	.35	.15	710	—	59	345	111
1900	7225.69	-9.3	.35	.15	688	—	59	270	112
1910	7229.21	-9.8	.35	.15	703	—	60	270	115
1920	7233.40	-10.4	.35	.15	712	—	60	285	116
1930	7237.20	-10.2	.35	.15	702	—	56	285	117
1940	7240.88	-10.4	.35	.15	713	—	55	285	117
TOTAL	47.19								
AVER.			0.35	0.15					

KVB DS 60-13
Rev. 5/79

KVB

Test No. 5/2-4A
Engr. TIDONA

STACK DATA

Date 10/3/79 Location #5 Unit No. 10 Fuel ODL WOOD
Load ____ K#/hr or MBtu/hr ____ Filter No. 110
Sample Box No. ____ Meter Box No. CU-2 Probe No. ____ Probe Length 4'
Stack Moisture 20 %
Ambient Temperature ____ °F
Nozzle Diameter 0.245 in.
Atmospheric Pressure 30.66 in.Hg
Stack Gas Pressure, Ps -4.0 iwg
Stack Area, As 100 ft²

Remarks:
Final Meter: 7317.18
Initial Meter: 7282.935

		Time	Vm (CF)	Vacuum (in. Hg)	ΔP (iwg)	ΔH (iwg)	T_s (°F)	$T_{imp.in}$ (°F)	$T_{imp.out}$ (°F)	T_{filter} (°F)	T_m (°F)
	1	1409	7284.42	3.8	.25	.13	648	160	67	255	85/87
	2	1419	7285.62	3.8	.32	.15	676	175	65	280	90/87
	3	1426	7287.94	3.8	.25	.11	664	175	65	290	95/90
	4	1438	7288.41	3.8	.26	.12	650	145	68	250	103/93
	5	1446	7289.69	3.8	.24	.11	670	160	69	280	109/95
	6	1454	7291.28	4.0	.33	.15	670	185	69	295	112/101
	7	1513	7292.43	3.8	.21	.09	643	120	80	250	110/105
	8	1523	7293.67	3.9	.19	.09	668	200	75	275	113/105
	9	1532	7294.72	3.8	.18	.08	670	160	75	280	117/107
	10	1544	7296.02	4.0	.21	.10	660	185	80	250	120/110
	11	1552	7297.15	4.0	.19	.09	676	170	75	280	125/115
	12	1601	7298.24	3.8	.16	.07	674	170	75	295	125/115
	13	1615	7299.46	4.2	.23	.11	670	140	75	255	120/113
END 4 min PTS.	14	1623	7300.75	5.0	.21	.10	693	200	65	275	123/115
	15	1630	7301.69	4.7	.21	.10	690	180	70	310	123/115
START 5 min POINTS	16	1646	7303.39	4.8	.28	.12	688	135	80	270	118/112
	17	1658	7305.44	5.6	.35	.16	701	170	75	290	120/110
	18	1707	7307.15	5.7	.23	.11	701	175	80	300	122/112
	19	1722	7309.12	6.0	.33	.16	717	190	75	250	115/110
and 5 min.	20	1731	7311.17	6.4	.33	.16	724	160	70	290	119/110
START 4 min.	21	1743	7312.74	5.4	.25	.12	711	135	75	290	120/112
	22	1754	7314.32	6.6	.31	.15	710	125	70	250	118/112
	23	1801	7315.63	6.0	.27	.13	715	150	70	285	120/113
	24	1810	7317.18	6.7	.31	.15	718	145	75	295	122/113
		TOTAL	34.245	4 min. pt	0.241	0.113					
		AVER.		5 min pt	0.290	0.138	1.84				104

Weighted Avg. = 0.265 0.120

KVB DS 60-13
Rev. 5/79

84.35
85.85
87.17
88.51
89.81
91.37
92.53
93.68

96.01
97.17
98.23
99.50
00.73
01.95
03.62
05.60

09.15
11.10
12.78
14.28
15.68
17.18

.7059(Avg. for 4 min pt) + .2941(Avg. for 5 min pt)

KVB

Test No. 5/4-2A

Engr.

STACK DATA

Date 10/2/79 Location 5 Unit No. 10 Fuel HOGGED

Load 160 K#/hr or MBtu/hr Filter No. 111

Sample Box No. Meter Box No. Probe No. Probe Length 4'

Stack Moisture 20 %

Ambient Temperature °F

Nozzle Diameter 0.245 in.

Atmospheric Pressure 30.14 in.Hg

Stack Gas Pressure, Ps -4.0 iwg

Stack Area, As 100 ft²

Remarks:

Final Meter: 7281.281

Initial Meter: 7243.393

	4 min Points Time	Vm (CF)	Vacuum (in. Hg)	ΔP (iwg)	ΔH (iwg)	T_s (°F)	$T_{imp.in}$ (°F)	$T_{imp.out}$ (°F)	T_{filter} (°F)	$T_{m\ out}$ (°F)
1	1134	7244.91	3.0	.30	.14	632	200	75	275	75
2	1143	7246.25	3.0	.23	.11	645	220	75	320	80
3	1200	7247.72	3.5	.32	.15	653	210	78	340	88
4	1212	7249.34	3.5	.34	.16	665	160	78	250	90
5	1221	7250.85	3.7	.32	.15	651	175	76	270	98
6	1229	7252.30	3.7	.28	.13	651	195	75	280	100
7	1241	7253.69	3.7	.30	.13	659	150	75	250	105
8	1249	7255.25	3.9	.33	.16	677	185	75	280	107
9	1300	7256.70	4.0	.28	.14	677	145	65	290	110
10	1345	7258.33	4.2	.34	.17	690	155	75	280	100
11	1350	7259.90	4.2	.29	.14	690	170	62	300	111/100
12	1356	7261.60	4.8	.37	.18	690	190	60	310	111/100
13	1412	7263.21	4.8	.34	.17	690	160	65	290	111/103
14	1419	7264.68	4.8	.30	.15	693	170	65	305	111/103
15	1428	7266.14	4.8	.28	.14	693	160	68	310	115/108
16	1443	7267.73	5.0	.37	.18	676	135	78	265	120/110
17	1451	7269.26	4.9	.33	.16	678	140	65	295	123/110
18	1500	7270.73	5.1	.31	.15	686	160	60	305	125/113
19	1515	7272.60	5.7	.42	.21	686	120	62	260	123/113
20	1523	7274.46	5.8	.40	.20	686	140	60	290	125/115
21	1535	7275.94	5.4	.31	.15	677	155	60	305	125/115
22	1544	7277.80	6.0	.46	.22	681	120	63	250	120/113
23	1551	7279.61	6.5	.48	.23	678	130	63	290	123/113
24	1600	7281.28	6.5	.31	.15	682	145	65	310	123/113
	TOTAL	37.89								
	AVER.			0.334	0.161	674				109

KVB DS 60-13

Rev. 5/79

KVB

Test No. 5/7-2
Engr. Buening

STACK DATA

Date 10/17/79 Location #5/No. 10 Boiler Out Unit No. 10. Fuel Hogged
Load ______ K#/hr or MBtu/hr ______ Filter No. ______
Sample Box No. ______ Meter Box No. CU-2 Probe No. ______ Probe Length 4 ft. el. 4
Stack Moisture 20 %
Ambient Temperature ______ °F
Nozzle Diameter .245 in.
Atmospheric Pressure 30.86 in.Hg
Stack Gas Pressure, Ps -4.0 iwg
Stack Area, As 100 ft^2

Remarks:
Final Meter: ______
Initial Meter: 7318.05

		4 min. points Time	Vm (CF)	Vacuum (in. Hg)	ΔP (iwg)	ΔH (iwg)	T_s (°F)	$T_{imp.in}$ (°F)	$T_{imp.out}$ (°F)	T_{filter} (°F)	T_m (°F) in/out
Port 2	1	11:00	7319.56	3.0	.30	.13	670	250	55	390	78/70
	2		7320.59	2.6	.09	.03	660	275	60	390	80/75
	3		7321.59	2.8	.11	.04	670	280	60	380	90/85
3	4		7323.04	3.7	.31	.14	670	230	60	380	98/90
	5		7324.06	3.2	.15	.07	670	250	60	380	105/95
	6		7325.25	3.5	.23	.10	670	260	65	390	112/103
4	7	1210	7326.50	3.8	.26	.11	665	240	65	390	112/103
	8		7327.81	3.7	.22	.10	670	275	60	390	115/104
	9		7329.05	3.7	.27	.12	680	280	60	390	120/104
5	10		7330.30	3.9	.24	.11	680	240	65	360	125/110
	11.	1245	7331.40	3.8	.20	.09	685	250	65	370	125/110
	12.		7332.50	3.7	.21	.09	700	270	62	380	130/112
6	13	28 min	7333.54	3.7	.19	.09	715	260	65	365	128/112
	14	51	7334.58	3.6	.16	.07	730	270	65	365	128/112
	15		7335.71	4.0	.19	.09	745	265	65	380	130/118
7	16		7337.20	5.1	.31	.15	780	210	70	390	122/115
	17		7338.51	4.6	.24	.12	780	265	70	390	125/115
	18.		7339.95	5.0	.29	.14	780	250	69	390	128/115
8	19		7341.35	5.2	.28	.13	765	215	68	340	121/115
	20		7342.67	5.0	.24	.11	760	225	70	350	123/116
	21		7343.53	4.4	.10	.05	760	250	70	360	118/112
9	22		7344.97	4.8	.21	.10	760	250	70	360	115/110
	23		7346.16	5.7	.28	.13	760	225	70	365	115/110
	24		7347.35	5.0	.22	.10	740	230	70	370	118/110
		TOTAL									
		AVER.			.22	.1004	715				105

KVB DS 60-13
Rev. 5/79

KVB

Test No. 5/7-2a
Engr. 6.

STACK DATA

Date 10/18/79 Location 5 Unit No. 10 Fuel Hoggard
Load ______ K#/hr or MBtu/hr ______ Filter No. ______
Sample Box No. ______ Meter Box No. cu·2 Probe No. ______ Probe Length 4ft. cf. l.o.f.
Stack Moisture 20 %
Ambient Temperature 63 °F
Nozzle Diameter .245 in.
Atmospheric Pressure 30.10 in.Hg
Stack Gas Pressure, Ps -4 iwg
Stack Area, As 100 ft^2

Remarks:
Final Meter: 7384.10
Initial Meter: 7347.35 (1145)

Port Module 356, Low NOx

	2 hrs. Time	Vm (CF)	Vacuum (in. Hg)	ΔP (iwg)	ΔH (iwg)	T_s (°F)	$T_{imp.in}$ (°F)	$T_{imp.out}$ (°F)	T_{filter} (°F)	T_m (°F)
15	1145 1200	7352.12	4.7	.23	.10	725	–	68	300	80/80
15	1205 1220	7356.79	5.1	.23	.10	700	–	69	350	90/85
15	1225 1240	7361.31	5.0	.23	.10	685	–	67	390	110/100
15	1240 1255	7365.76	5.1	.23	.10	685	–	68	390	112/102
15	1240 1310	7370.40	5.3	.23	.10	690	–	65	390	120/102
15	1310 1325	7375.04	5.3	.23	.10	690	–	66	390	120/108
15	1325 1340	7379.48	5.6	.23	.10	695	–	68	395	120/110
15	1340 1355	7384.10	6.3	.23	.10	695	–	66	395	126/116
	TOTAL									
	AVER.			.23	.10	696				100

KVB DS 60-13
Rev. 5/79

KVB

Test No. 5/7-2c
Engr. Tidona

STACK DATA

Date 10/23/79 Location ~~#5~~ D.C. & Scrubber Outlet Unit No. 10 Fuel Hogged
Load ______ K#/hr or MBtu/hr ______ Filter No. 5
Sample Box No. ______ Meter Box No. CU-3 Probe No. ______ Probe Length 9 ft.
Stack Moisture ______ %
Ambient Temperature ______ °F
Nozzle Diameter .245 in.
Atmospheric Pressure ______ in.Hg
Stack Gas Pressure, Ps ___ iwg
Stack Area, As ______ ft^2

Remarks:
Final Meter: 1511.06
Initial Meter: 1472.35

start 1825	7 min points Time	Vm (CF)	Vacuum (in. Hg)	ΔP (iwg)	ΔH (iwg) uncor/corr.	T_s (°F)	$T_{imp.in}$ (°F)	$T_{imp.out}$ (°F)	T_{filter} (°F)	T_m (°F)
1		1475.15	1.6	.27	.30/.37	158	148	52	265	68/68
2		1478.80	1.7	.25	.28/.35	158	160	52	300	75/75
3		1482.55	1.8	.27	.30/.37	158	160	52	305	75/75
4		1485.[illegible]	1.9	.27	.30/.37	156	110	55	310	75/75
O_2: 6.6 5	8 min →	1486.69	2.0	.28	.31/.38	156	155	55	310	75/75
6		1489.71	2.5	.33	.37/.41	158	162	55	290	80/80
O_2: 12.3 → 7		1493.41	2.9	.38	.43/.51	157	170	55	260	80/80
8	8 min	1497.18	3.0	.41	.46/.53	156	160	50	300	80/80
9		1500.[illegible]	3.4	.42	.47/.53	157	180	55	290	80/80
O_2: 11.2 → 10		1504.04	3.9	.48	.48/.55	155	200	55	300	80/80
11		1507.54	4.7	.41	.46/.53	157	160	60	300	80/80
O_2: 9.0 → 12		1511.06	4.3	.36	.40/.47	157	160	60	300	80/80
	TOTAL									
	AVER.									

1850 = O_2 6.2

KVB DS 60-13
Rev. 5/79

Note – point #5 8 min.
– point #8 8 min

KVB

Test No. 5/7-2C

Engr. TIDONA

STACK DATA

Date 10/23/79 Location BOILER OUT Unit No. #10 out Fuel HOGGED

Load 160 K#/hr or MBtu/hr ______ Filter No. #114

Sample Box No. 1 Meter Box No. CU2 Probe No. ______ Probe Length ______

Stack Moisture ______ %

Ambient Temperature ______ °F

Nozzle Diameter ______ in.

Atmospheric Pressure ______ in.Hg

Stack Gas Pressure, Ps ______ iwg

Stack Area, As ______ ft^2

Remarks:

Final Meter: 7417.04

Initial Meter: 7384.35

φ Time	Vm (CF)	Vacuum (in. Hg)	ΔP (iwg)	ΔH (iwg)	T_s (°F)	$T_{imp.in}$ (°F)	$T_{imp.out}$ (°F)	T_{filter} (°F)	T_m (°F)
4	7385.70	4.0	.27	.2162	720	200	70	340	80
8	7387.04	4.0	.25	.2002	720	220	70	380	80
12	7388.22	4.0	.18	.1417	700	180	70	380	80
16	7389.38	4.0	.22	.1613	620	150	70	300	80
20	7390.51	4.0	.20	.1602	720	170	70	380	80
24	7391.68	4.0	.21	.1642	640	170	70	380	80
28	7392.66	4.0	.15	.1151	670	150	80	360	80
32	7393.60	4.0	.14	.1055	650	200	80	370	100
36	7394.52	4.0	.14	.1007	600	200	80	380	100
40	7396.16	4.0	.42	.3106	630	200	70	340	110
44	7397.74	4.5	.39	.2990	670	200	70	350	110
48	7399.15	5.0	.31	.2335	650	200	70	370	110
52	7400.59	5.0	.33	.2486	650	220	70	340	110
56	7402.14	6.0	.37	.2812	660	230	60	340	115
60	7404.11	7.0	.60	.4558	660	240	60	360	115
64	7405.69	6.0	.40	.2985	640	170	70	340	115
68	7407.18	6.0	.35	.2612	640	180	70	340	115
72	7408.59	5.0	.32	.2389	640	240	60	340	115
76	7410.00	5.0	.34	.2538	640	200	60	340	115
80	7411.41	6.0	.32	.2389	640	200	60	340	115
84	7412.78	7.0	.30	.2239	640	200	65	320	110
88	7414.10	5.0	.27	.2016	640	200	65	330	110
92	7415.46	5.0	.30	.2209	625	220	65	350	110
96	7417.04	7.0	.40	.2999	645	200	65	350	110
TOTAL									
AVER.			.30	.23	654.58			350.87	98.54

KVB DS 60-13

Rev. 5/79

KVB
A Research-Cottrell Company

BRINK CASCADE IMPACTOR DATA SHEET

TEST NO. 5/2-1B
LOAD 160,000 lb/hr
TEST SITE 5
% O_2 8,3
TEST DATE 9/20/79
FUEL HOGGED WOOD
SAMPLE LOCATION 8" from inside wall
SPECIAL CONDITIONS BASELINE

GAS VELOCITY DETERMINATION

PITOT TUBE ΔP 0.36
BAROMETRIC PRESS in. Hg, P_{bar} 30.66
GAS TEMP. °R, Ts 1160
GAS STATIC PRESS in. H_2O −4.7
PITOT CORRECTION FACTOR, Cp 0,837
GAS STATIC PRESS in. Hg abs, Ps 30,31
MOLECULAR WT. FLUE GAS, MW_s 26,7
P_m = 27.35

$$Vs = 85.48\ Cp\ \left(\frac{Ts\ \Delta P}{Ps\ MWs}\right)^{1/2} = 40.0 \text{ ft/sec}$$

IMPACTOR FLOW RATE DETERMINATION

NOZZLE DIAMETER inches, Dn 0.0787
NOZZLE AREA ft^2, An 3.378×10^{-5} $An = \pi(Dn/24)^2$

$Qn = Vs\ An\ 60$ = 0.080 ft^3/min at nozzle

$Qc = Qs\ \left(\frac{PsMWs}{1.3Ts}\right)^{1/2}$ = — ft^3/min corrected to calibration conditions

PRESSURE DROP ACROSS IMPACTOR FROM CALIBRATION CURVE — in. H_2O

OPERATING VACUUM (corrected for static pressure of duct) — ~~in. H_2O~~ 3.3 in Hg

ISOKINETICS DETERMINATION

	SAMPLE TIME (θ)	METER READING (Vm)	METER TEMP (Tm)
INITIAL	13:46	99.500	82°F
FINAL	14:31	101.004	88
Δ	45 min	1.504	Avg. = 85

$\%H_2O$ = 17.8 %

$$I = \frac{1.667\ Ts\ Vm\ P_m}{\theta\ Tm\ Vs\ Ps\ An(1-\frac{\%H_2O}{100})} = 96.2\ \%$$

KVB DS6017-40

Test No. 5/2-1B

CASCADE IMPACTOR DATA SHEET

TEST RUN NO. 5/2-1B LOCATION 5 DATE 9/20/79

IMPACTOR NO. ______ CYCLONE NO. ______ OPERATOR ______

SAMPLE POINT LOCATION 8" FROM INSIDE WALL

SUBSTRATE COATING PARTICULATE FILTER MATERIAL FUEL HOGGED WOOD TEST LOAD 160 klb/hr

IMPACTOR ORIENTATION HORIZONTAL FLOW THRU IMPACTOR 0.080 ACFM

FLUE STATIC PRESSURE -4.7 inH_2O, VELOCITY 40.0 FPS

NOZZLE DIA. 2 mm IMPACTOR PRESSURE DROP ______ END TIME 14:31:00

GAS METER END 101.004 CF START TIME 13:46:00

GAS METER START 99.500 CF DURATION 45 MIN.

GAS VOLUME 1.504 CF FLOW RATE 0.0334 CFM @ METER

AMBIENT TEMPERATURE 70 °F PRESSURE 30.66 IN Hg. HUMIDITY — %

FLUE GAS MOLECULAR WT. 26.7, TEMP. 700 °F, DENSITY ______ g/cc, VISCOSITY ______ POISE

AVG. METER TEMP. = 85°F METER VACUUM = 3"Hg (AVG.)

	Stage Number							Stage Blank
	1	2	3	4	5			
Foil + Sample, g								
Unused Foil, g								
Sample, g								
Correction for Blank, g								
Final Sample, g								

FILTER NO.	Sample	Blank
FILTER + SAMPLE, g		
FILTER TARE, g		
SAMPLE, g		
CORRECTION FOR BLANK, g		
FINAL SAMPLE, g		

FULL CONTAINER, g ______

EMPTY CONTAINER, g ______

CYCLONE CATCH, g ______

KVB
A Research-Cottrell Company

BRINK CASCADE IMPACTOR DATA SHEET

TEST NO. 5/2-1d
LOAD 160,000 lb stm/hr
TEST SITE 5
% O_2
TEST DATE 9/25/79
FUEL HOGGED WOOD
SAMPLE LOCATION BLR. OUT.
SPECIAL CONDITIONS BASELINE

GAS VELOCITY DETERMINATION

PITOT TUBE ΔP 0.41
GAS TEMP. °R, Ts 1155
PITOT CORRECTION FACTOR, Cp 0.837
BAROMETRIC PRESS in. Hg, P_{bar} 30.58
GAS STATIC PRESS in. H_2O -4.0
GAS STATIC PRESS in. Hg abs, Ps 30.29
MOLECULAR WT. FLUE GAS, MW_s 27.0
$P_m = 27.58$

$$Vs = 85.48\ Cp \left(\frac{Ts\ \Delta P}{Ps\ MWs}\right)^{1/2} = 54.4 \text{ ft/sec}$$

IMPACTOR FLOW RATE DETERMINATION

NOZZLE DIAMETER inches, Dn 0.0787
NOZZLE AREA ft^2, An 3.3816×10^{-5}
$An = \pi(Dn/24)^2$

$Qn = Vs\ An\ 60$ = 0.110 ft^3/min at nozzle

$Qc = Qs \left(\frac{PsMWs}{1.3Ts}\right)^{1/2}$ = ______ ft^3/min corrected to calibration conditions

PRESSURE DROP ACROSS IMPACTOR FROM CALIBRATION CURVE ______ in. H_2O

OPERATING VACUUM (corrected for static pressure of duct) 3" Hg in. H_2O

ISOKINETICS DETERMINATION

	SAMPLE TIME (θ)	METER READING (Vm)	METER TEMP (Tm)
INITIAL	12:58:00	101.083	86°F
FINAL	13:18	101.950	87°F
Δ	20.0	0.867	87 avg.

$\%H_2O$ = 20 %

$$I = \frac{1.667\ Ts\ Vm\ \overset{P_m}{\cancel{P_{bar}}}}{\theta\ Tm\ Vs\ Ps\ An\left(1-\frac{\%H_2O}{100}\right)} = 94.4\ \%$$

KVB DS6017-40

LK TST .012 CFM @ 7in Hg
≃20% of sample flow rate

KVB
A Research-Cottrell Company

BRINK CASCADE IMPACTOR DATA SHEET

TEST NO. 5/2-1F
LOAD 160000 lb/h
TEST SITE 5
% O_2
TEST DATE 10/1/79
FUEL HOGGED WOOD
SAMPLE LOCATION Blr. Out.
SPECIAL CONDITIONS BASELINE

GAS VELOCITY DETERMINATION

PITOT TUBE ΔP 0.36 iwg
GAS TEMP. °R, Ts 692+460=1152
PITOT CORRECTION FACTOR, Cp 0.837
BAROMETRIC PRESS in. Hg, P_{bar} 30.78
GAS STATIC PRESS in. H_2O -4.0
GAS STATIC PRESS in. Hg abs, Ps 30.49
MOLECULAR WT. FLUE GAS, MWs 27.0

$$V_s = 85.48\ C_p \left(\frac{T_s\ \Delta P}{P_s\ MW_s}\right)^{1/2} = 50.78 \text{ ft/sec}$$

IMPACTOR FLOW RATE DETERMINATION

NOZZLE DIAMETER inches, Dn 0.0787
NOZZLE AREA ft^2, An 3.3781×10^{-5}
$A_n = \pi(D_n/24)^2$

$Q_n = V_s\ A_n\ 60 = 0.103$ ft^3/min at nozzle

$Q_c = Q_s \left(\frac{P_s MW_s}{1.3 T_s}\right)^{1/2} =$ — ft^3/min corrected to calibration conditions

PRESSURE DROP ACROSS IMPACTOR FROM CALIBRATION CURVE — in. H_2O

OPERATING VACUUM (corrected for static pressure of duct) — in. H_2O

ISOKINETICS DETERMINATION

	SAMPLE TIME (θ)	METER READING (Vm)	METER TEMP (Tm)
INITIAL	10:27	111,413	78 °F
FINAL	11:27	113.168	77°F
Δ ACTUAL TEST TIME	30 min	1.755	78°F

$\%H_2O = 20\ \%$

$$I = \frac{1.667\ T_s\ V_m\ \cancel{P_{bar}}\ P_m}{\theta \cdot T_m\ V_s\ P_s\ A_n(1-\frac{\%H_2O}{100})} = 113.3\ \% \times 0.8$$

$= 90.1$
(accounting for leak)

KVB DS6017-40

KVB
A Research-Cottrell Company

LK. RATE = 0.008 cfm
@ 7" Hg vac.

BRINK CASCADE IMPACTOR DATA SHEET

TEST NO. 5/2-4A
LOAD 160,000
TEST SITE 5, BLR OUT
% O_2 LOW
TEST DATE 10-3-79
FUEL HOGGED WOOD
SAMPLE LOCATION BLR OUT
SPECIAL CONDITIONS LOW O_2

GAS VELOCITY DETERMINATION

PITOT TUBE ΔP 0.25
GAS TEMP. °R, T_s 1135
PITOT CORRECTION FACTOR, C_p 0.837
BAROMETRIC PRESS in. Hg, P_{bar} 30.76
GAS STATIC PRESS in. H_2O -4.0
GAS STATIC PRESS in. Hg abs, P_s 30.46
MOLECULAR WT. FLUE GAS, MW_s 27.0

$V_s = 85.48\ C_p\ \left(\frac{T_s\ \Delta P}{P_s\ MW_s}\right)^{1/2} =$ 42.02 ft/sec

IMPACTOR FLOW RATE DETERMINATION

NOZZLE DIAMETER inches, D_n .0787 (2mm)
NOZZLE AREA ft², A_n 3.3816×10^{-5}
$A_n = \pi(D_n/24)^2$

$Q_n = V_s\ A_n\ 60 =$ .0852 ft³/min at nozzle
$Q_c = Q_s\ \left(\frac{P_s MW_s}{1.3 T_s}\right)^{1/2} =$ .041 ft³/min corrected to calibration conditions

PRESSURE DROP ACROSS IMPACTOR FROM CALIBRATION CURVE ______ in. H_2O
OPERATING VACUUM (corrected for static pressure of duct) 7.0" Hg in. H_2O

$$Q_m = Q_n \left(\frac{T_m (R^\circ)}{T_s (R^\circ)}\right) \frac{P_s}{P_m} \left(1 - \frac{\% H_2O}{100}\right) = .041$$

ISOKINETICS DETERMINATION

	SAMPLE TIME (θ)	METER READING (V_m)	METER TEMP (T_m)
INITIAL	0	116,198	539 R°
FINAL	20	117,328	539 R°
Δ	20	1,130	539 R°

$\% H_2O =$ 20.0 %

$$I = \frac{1.667\ T_s\ V_m\ P_{bar}}{\theta\ T_m\ V_s\ P_s\ A_n (1 - \frac{\% H_2O}{100})} = 117.3\ \%$$

$$Q_m + Q_{LEAK} = Q_m\ \text{ACTUAL} = .049$$

KVB DS6017-40

$$\frac{Q_m}{Q_m(ACT)} (V_m) = V_m\ ACT = 0.97$$

KVB
A Research-Cottrell Company

BRINK CASCADE IMPACTOR DATA SHEET

TEST NO. 5/7-2
TEST SITE 5
TEST DATE 10-17-79
SAMPLE LOCATION BOILER # 10 OUT
LOAD 160,000
% O_2
FUEL HOGGED WOOD
SPECIAL CONDITIONS

GAS VELOCITY DETERMINATION

PITOT TUBE ΔP .32
GAS TEMP. °R, Ts 1120
PITOT CORRECTION FACTOR, Cp .837
BAROMETRIC PRESS in. Hg, P_{bar} 30.94
GAS STATIC PRESS in. H_2O -4
GAS STATIC PRESS in. Hg abs, Ps 30.63
MOLECULAR WT. FLUE GAS, MWs 27.0

$$V_s = 85.48\ C_p \left(\frac{T_s\ \Delta P}{P_s\ MW_s}\right)^{1/2} = 47.1 \text{ ft/sec}$$

IMPACTOR FLOW RATE DETERMINATION

NOZZLE DIAMETER inches, Dn 0.0787
NOZZLE AREA ft², An 3.3781×10^{-5}
$A_n = \pi(D_n/24)^2$

$Q_n = V_s\ A_n\ 60$ = 0.09547 ft³/min at nozzle

$Q_c = Q_s \left(\frac{P_s MW_s}{1.3 T_s}\right)^{1/2}$ = — ft³/min corrected to calibration conditions

PRESSURE DROP ACROSS IMPACTOR FROM CALIBRATION CURVE — in. H_2O

OPERATING VACUUM (corrected for static pressure of duct) — in. H_2O 8 in Hg

ISOKINETICS DETERMINATION

= ,048 + .008 LK RT = .056

1.872

$Q_m = Q_n \frac{T_m}{T_S} \frac{P_s}{P_m} \left(1 \frac{\% H_2O}{100}\right)$

$\% H_2O$ = 20.0 %

	SAMPLE TIME (θ)	METER READING (Vm)	METER TEMP (Tm)
INITIAL	0	919.719	536
FINAL	36	921.710	536
Δ	36	1.99	536

$$I = \frac{1.667\ T_s\ V_m\ P_{bar} P_m}{\theta\ T_m\ V_s\ P_s\ A_n (1 - \frac{\% H_2O}{100})} = 96.7 \%$$

Vm CALC - LK Vm = Vm ACT = 1.70

KVB DS6017-40

KVB
A Research-Cottrell Company

BRINK CASCADE IMPACTOR DATA SHEET

TEST NO. 5/7-2a
LOAD 160,000
TEST SITE 5
% O_2 4.6 AVG
TEST DATE 10-18-79
FUEL HOGGED WOOD
SAMPLE LOCATION BOILER #10 OUT
SPECIAL CONDITIONS

GAS VELOCITY DETERMINATION

PITOT TUBE ΔP .26
GAS TEMP. °R, Ts 1115
PITOT CORRECTION FACTOR, Cp .837
BAROMETRIC PRESS in. Hg, P_{bar} 30.18
GAS STATIC PRESS in. H_2O -4
GAS STATIC PRESS in. Hg abs, Ps 29.87
MOLECULAR WT. FLUE GAS, MW_s 27.0

$P_m = 22.87$

$$V_s = 85.48\ C_p \left(\frac{T_s\ \Delta P}{P_s\ MW_s}\right)^{1/2} = 42.9 \text{ ft/sec}$$

IMPACTOR FLOW RATE DETERMINATION

NOZZLE DIAMETER inches, Dn 0.0787
NOZZLE AREA ft^2, An 3.3781×10^{-5} $An = \pi(Dn/24)^2$

$Qn = Vs\ An\ 60$ = .087 ft^3/min at nozzle

$Qc = Qs \left(\frac{PsMWs}{1.3Ts}\right)^{1/2}$ = — ft^3/min corrected to calibration conditions

PRESSURE DROP ACROSS IMPACTOR FROM CALIBRATION CURVE — in. H_2O

OPERATING VACUUM (corrected for static pressure of duct) — in. H_2O

ISOKINETICS DETERMINATION

0435 + .01 = .0535 CFM

	SAMPLE TIME (θ)	METER READING (Vm)	METER TEMP (Tm)
INITIAL	0	922.159	534
FINAL	32	923.810	534
Δ	32	1.651	534

% H_2O = 20 %

$$I = \frac{1.667\ T_s\ V_m\ \cancel{P_{bar}}\ P_m}{\theta\ T_m\ V_s\ P_s\ A_n\left(1-\frac{\%H_2O}{100}\right)} = 95.6\ \%$$

Lk RT = .01 CFM

1.651 - .32(Lk) = 1.331

KVB DS6017-40

KVB
A Research-Cottrell Company

BRINK CASCADE IMPACTOR DATA SHEET

TEST NO. 5/7-2B
LOAD 160,000
TEST SITE 5
% O_2
TEST DATE 10-22-79
FUEL HOGGED
SAMPLE LOCATION BOILER OUT
SPECIAL CONDITIONS LOW NO DESIGN

GAS VELOCITY DETERMINATION

PITOT TUBE ΔP .26
BAROMETRIC PRESS in. Hg, P_{bar} 30,33
GAS TEMP. °R, Ts 1096
GAS STATIC PRESS in. H_2O -4
PITOT CORRECTION FACTOR, Cp .837
GAS STATIC PRESS in. Hg abs, Ps 30.04
MOLECULAR WT. FLUE GAS, MWs 27

$$Vs = 85.48\ Cp \left(\frac{Ts\ \Delta P}{Ps\ MWs}\right)^{1/2} = 42.41 \text{ ft/sec}$$

IMPACTOR FLOW RATE DETERMINATION

NOZZLE DIAMETER inches, Dn 0.0787
NOZZLE AREA ft^2, An 3.3781×10^{-5} $An = \pi(Dn/24)^2$

$Qn = Vs\ An\ 60 = .086$ ft^3/min at nozzle

$Qc = Qs \left(\frac{PsMWs}{1.3Ts}\right)^{1/2} = $ — ft^3/min corrected to calibration conditions

PRESSURE DROP ACROSS IMPACTOR FROM CALIBRATION CURVE — in. H_2O

OPERATING VACUUM (corrected for static pressure of duct) — in. H_2O

$Om = On \frac{Tn}{TS} \frac{Ps}{PR} \left(1 \frac{\%H_2O}{100}\right)$

ISOKINETICS DETERMINATION

LKRJ = .019
Om = ,0458
,0648

	SAMPLE TIME (θ)	METER READING (Vm)	METER TEMP (Tm)
INITIAL	16:23	925.402	76
FINAL	17:00	927.800	78
Δ	37.0	2.398	

1.695 (ACT.)

%H_2O = — %

$$I = \frac{1.667\ Ts\ Vm\ P_{bar}}{\theta\ Tm\ Vs\ Ps\ An(1-\frac{\%H_2O}{100})} = 101.3\ \%$$

KVB DS6017-40

KVB

A Research-Cottrell Company

BRINK CASCADE IMPACTOR LAB WORKSHEET

TEST No. 5/2-1B

LOCATION 5, BLR. OUT

TEST DATE 9/20/79

ENGINEER TIDONA

TEST DESCRIPTION BASELINE, PARTICULATE

PRE TEST WEIGHTS (GRAMS)

PLATE NO.		CYCLONE	1	2	3	4	5	FINAL FILTER
DATE WT.		9/14/79	9/17/79	9/17/79	9/17/79	9/17/79	9/17/79	9/18/79
TARE WT.	1	100.0734	3.6609	3.3506	3.7344	3.2823	3.7552	0.0372
	2	100.0730	3.6608	3.3507	3.7341	3.2825	3.7550	0.0372
	3	100.0733	3.6606	3.3506	3.7340	3.2822	3.7549	0.0372
	4							
AVERAGE		100.0732	3.6608	3.3506	3.7342	3.2823	3.7550	0.0372

POST TEST WEIGHTS (GRAMS)

DATE WT.		9/21	9/21/79	9/21/79	9/21/79	9/21/79	9/21	9/21
GROSS WT.	1	100.2023	3.6615	3.3538	3.7416	3.2849	3.7606	0.0392
	2	100.2025	3.6614	3.3539	3.7417	3.2847	3.7609	0.0391
	3	100.2026	3.6616	3.3538	3.7418	3.2848	3.7607	0.0394
	4							
AVERAGE		100.2025	3.6615	3.3538	3.7417	3.2848	3.7607	0.0393

NET TEST RESULTS GRAMS)

NET WT.	0.1293	0.0007	0.0032	0.0075	0.0025	0.0057	0.0021
PERCENT	85.63	0.46	2.12	4.97	1.66	3.77	1.39

TOTAL NET WEIGHT 151.0 mgm

KVB DS6017-38

KVB
A Research-Cottrell Company

BRINK CASCADE IMPACTOR LAB WORKSHEET

TEST No. 5/2-1d
LOCATION 5, BLR. OUT
TEST DATE 9/25/79
ENGINEER TIDONA
TEST DESCRIPTION BASELINE, GOKSOYR-ROSS TEST

PRE TEST WEIGHTS (GRAMS)

PLATE NO.		CYCLONE	1	2	3	4	5	FINAL FILTER
DATE WT.		9/27	9/23/79	9/23	9/23	9/23	9/23	9/18/79
TARE WT.	1	8.2054	3.6605	3.3498	3.7347	3.2827	3.7544	0.0370
	2	8.2054	3.6603	3.3499	3.7348	3.2824	3.7542	0.0369
	3	8.2055	3.6604	3.3496	3.7345	3.2825	3.7541	0.0369
	4							
AVERAGE		8.2054	3.6604	3.3498	3.7347	3.2825	3.7542	0.0369

POST TEST WEIGHTS (GRAMS)

DATE WT.		9/27	9/27	9/27	9/27	9/27	9/27	9/27
GROSS WT.	1	8.2277	3.6618	3.3517	3.7373	3.2844	3.7568	.0438
	2	8.2278	3.6618	3.3518	3.7373	3.2843	3.7567	.0438
	3	8.2276	3.6618	3.3518	3.7371	3.2844	3.7568	.0439
	4							
AVERAGE		8.2277	3.6618	3.3518	3.7372	3.2843	3.7568	.0438

NET TEST RESULTS GRAMS)

NET WT.	0.0223	.0014	.0020	.0025	.0018	.0026	.0069
PERCENT	56.46	3.54	5.06	6.33	4.56	6.58	17.47

TOTAL NET WEIGHT 39.5 mgm

KVB DS6017-38

KVB
A Research-Cottrell Company

BRINK CASCADE IMPACTOR LAB WORKSHEET

TEST No. 5/2-1F
LOCATION #5
TEST DATE 9/28/79
ENGINEER TIDONA
TEST DESCRIPTION

PRE TEST WEIGHTS (GRAMS)

PLATE NO.		CYCLONE	1	2	3	4	5	FINAL FILTER
DATE WT.		9/27	9/27	9/27	9/27	9/27	9/27	9/27
TARE WT.	1	8.0163	3.6726	3.2609	3.6625	3.2498	3.7360	0.0371
	2	8.0162	3.6727	3.2607	3.6623	3.2497	3.7360	0.0370
	3	8.0163	3.6726	3.2607	3.6624	3.2497	3.7359	0.0370
	4							
AVERAGE		8.0163	3.6726	3.2608	3.6624	3.2497	3.7360	0.0370

POST TEST WEIGHTS (GRAMS)

DATE WT.		10/2	10/2	10/2	10/2	10/2	10/2	10/2
GROSS WT.	1	8.1444	3.6751	3.2633	3.6660	3.2513	3.7396	.0391
	2	8.1445	3.6750	3.2635	3.6661	3.2515	3.7397	.0390
	3	8.1443	3.6748	3.2637	3.6662	3.2515	3.7396	.0391
	4							
AVERAGE		8.1444	3.6750	3.2635	3.6661	3.2515	3.7396	.0391

NET TEST RESULTS ([redacted]GRAMS)

NET WT.	0.1281	0.0024	0.0027	0.0037	0.0018	0.0036	0.0021
PERCENT	88.71	1.66	1.87	2.56	1.25	2.49	1.45

TOTAL NET WEIGHT 144.4 mgm

KVB DS6017-38

KVB

A Research-Cottrell Company

BRINK CASCADE IMPACTOR LAB WORKSHEET

TEST No. 5/2-4A

LOCATION #5 #10 Boiler Out

TEST DATE 10/3/79

ENGINEER Tidona

TEST DESCRIPTION BRINK

PRE TEST WEIGHTS (GRAMS)

PLATE NO.		CYCLONE	1	2	3	4	5	FINAL FILTER
DATE WT.		10/2	10/2	—	—	—	—	>
TARE WT.	1	8.0163	3.6605	3.3501	3.7343	3.2817	3.7547	.0377
	2	8.0162	3.6602	3.3500	3.7341	3.2818	3.7544	.0378
	3	8.0163	3.6603	3.3499	3.7341	3.2816	3.7545	.0379
	4							
AVERAGE		8.0163	3.6603	3.3500	3.7342	3.2817	3.7545	.0378

POST TEST WEIGHTS (GRAMS)

DATE WT.		10/4	—	—	—	—	>	10/4
GROSS WT.	1	8.1444	3.6631	3.3560	3.7377	3.2853	3.7630	.0412
	2	8.1445	3.6631	3.3560	3.7377	3.2854	3.7630	.0412
	3	8.1443	3.6630	3.3560	3.7378	3.2854	3.7630	.0413
	4							
AVERAGE		8.1444	3.6631	3.3560	3.7377	3.2854	3.7630	.0412

NET TEST RESULTS (MILLIGRAMS)

NET WT.	.1281	0.0028	0.0060	0.0035	0.0037	0.0085	0.0034
PERCENT	82.11	1.79	3.84	2.24	2.37	5.45	2.18

TOTAL NET WEIGHT 0.1560 mgm

KVB
A Research-Cottrell Company

BRINK CASCADE IMPACTOR LAB WORKSHEET

TEST No. 5/7-2 LOCATION 5

TEST DATE 10-17-79 ENGINEER BUENING

TEST DESCRIPTION (BOILER OUT #10)

PRE TEST WEIGHTS (GRAMS)

PLATE NO.		0 CYCLONE	1	2	3	4	5	FINAL FILTER
DATE WT.		10-8-79						
TARE WT.	1	8.0656	3,6750	3,2609	3.6626	3,2486	3.7352	0.0369
	2	8,0656	3.6749	3.2609	3.6626	3.2487	3,7352	0.0371
	3	8.0657	3.6747	3.2609	3.6626	3.2487	3.7353	0.0370
	4							
AVERAGE								

POST TEST WEIGHTS (GRAMS)

DATE WT.		10-18-79						
GROSS WT.	1	8.1443	3.6760	3.2633	3.6678	3.2499	3.7394	0.0530
	2	8.1443	3.6760	3,2632	3.6678	3.2498	3.7395	0.0531
	3	8.1443	3.6760	3.2633	3.6678	3.2498	3.7395	0.0530
	4							
AVERAGE								

NET TEST RESULTS (MILLIGRAMS)

NET WT.	.0774	.0011	.0024	.0154	.0012	.0042	.016
PERCENT	65.8	.9	2.0	13.1	1.0	3.6	13.6

TOTAL NET WEIGHT .1177 ~~m~~gm

KVB DS6017-38

KVB

A Research-Cottrell Company

BRINK CASCADE IMPACTOR LAB WORKSHEET

TEST No. 5/7-2a LOCATION 5

TEST DATE 10-18-79 ENGINEER Buening

TEST DESCRIPTION

PRE TEST WEIGHTS (GRAMS)

PLATE NO.		② CYCLONE	1	2	3	4	5	FINAL FILTER
DATE WT.		10-18-79						
TARE WT.	1	8.1585	3.6601	3.3506	3.7345	3.2822	3.7546	0.0380
	2	8.1584	3.6600	3.3505	3.7345	3.2821	3.7547	0.0382
	3	8.1585	3.6600	3.3505	3.7345	3.2821	3.7547	0.0383
	4							
AVERAGE		8.1585	3.6600	3.3505	3.7345	3.2821	3.7547	0.0382

POST TEST WEIGHTS (GRAMS)

DATE WT.		10-21-79						
GROSS WT.	1	8.2140	3.6630	3.3591	3.7370	3.2837	3.7573	0.0583
	2	8.2141	3.6629	3.3592	3.7369	3.2838	3.7572	0.0584
	3	8.2138	3.6630	3.3591	3.7369	3.2838	3.7574	0.0585
	4							
AVERAGE		8.2140	3.6630	3.3591	3.7369	3.2838	3.7573	0.0584

NET TEST RESULTS (MILLIGRAMS)

NET WT.	0.0555	0.0030	0.0086	0.0024	0.0017	0.0026	0.0202
PERCENT	59.0	3.2	9.1	2.6	1.8	2.8	21.5

TOTAL NET WEIGHT 0.094 mgm

KVB DS6017-38

KVB

A Research-Cottrell Company

BRINK CASCADE IMPACTOR LAB WORKSHEET

TEST No. 5/7-2B LOCATION 5

TEST DATE 10-22-79 ENGINEER TIDONA

TEST DESCRIPTION low NO design

PRE TEST WEIGHTS (GRAMS)

PLATE NO.		CYCLONE	1	2	3	4	5	FINAL FILTER
DATE WT.		10-21-79						→
TARE WT.	1	8.0644	3.6753	3.2615	3.6643	3.2488	3.7359	0.0371
	2	8.0644	3.6752	3.2615	3.6645	3.2489	3.7360	0.0370
	3	8.0645	3.6752	3.2615	3.6644	3.2487	3.7362	0.0369
	4							
AVERAGE		8.0644	3.6752	3.2615	3.6644	3.2488	3.7360	.0370

POST TEST WEIGHTS (GRAMS)

DATE WT.		10/24	10/24	10/24	10/24	10/24	10/24	10/24
GROSS WT.	1	8.2140	3.6763	3.2637	3.6688	3.2543	3.7507	.0381
	2	8.2143	3.6761	3.2638	3.6689	3.2544	3.7504	.0382
	3	8.2140	3.6762	3.2639	3.6687	3.2544	3.7505	.0381
	4							
AVERAGE		8.2141	3.6762	3.2638	3.6688	3.2544	3.7505	.0381

NET TEST RESULTS (~~MILLI~~GRAMS)

NET WT.	.1497	.0010	.0023	.0044	.0056	.0145	.0011
PERCENT	83.87	.56	1.29	2.46	3.14	8.12	.616

TOTAL NET WEIGHT 0.1785 ~~m~~gm

KVB DS6017-38

KVB

BRINK IMPACTOR DATA REDUCTION

HP-67

Test No. 5/2-1b Date of Test 9-20-79 Engineer TIDONA

Sample Location #10 Blr. Out. Conditions Baseline

NOTE: Clear storage registers, then load program.

PRESS		Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
STO 0	Estimated D_{50} (Stokes) diameter (CM)	0.001	0.001	0.0001	0.0001	0.0001
STO 1	D_j = jet diameter of stage (CM)	0.2490	0.1775	0.1396	0.0946	0.0731
STO 2	F_j = pressure factor of stage (N.D.)	0.0210	0.0273	0.0395	0.0903	0.3277
STO 3	ρ_p = density of particles (g/CM^3)	2.5	2.5	2.5	2.5	2.5

STO 4 μ = viscosity of flue gas (poise) 2.95×10^{-4}

STO 5 MW = molecular weight of flue gas (g/g-mole) 26.7

STO 6 ΔP_I = pressure drop across impactor (in.H_2O) 40.3

STO 7 P_S = absolute stack pressure (in. Hg) 30.31

STO 8 T_S = absolute stack temperature (°R) 1160

STO 9 Q_S = flow rate at stack conditions (ft^3/min) 0.080

NOTE: The following items are calculated for each Brink stage. After the first run through the program, only the first four items above need be input again for each succeeding stage.

		1	2	3	4	5
A	Calculate mean free path length, ℓ (CM)	2.48×10^{-5}	2.49×10^{-5}	2.49×10^{-5}	2.50×10^{-5}	2.56×10^{-5}
B	Calculate D_{50} (Stokes) diameter (μm)	2.85	1.60	1.03	0.462	0.241
C	Calculate D_{50} (Aerodynamic Impaction) diameter (μm)	4.97	2.99	2.08	1.16	0.778
D	Calculate D_{50} (Aerodynamic) diameter (μm)	4.67	2.70	1.80	0.875	0.497

DATA SHEET NO. 60-35
4/80

KVB

BRINK IMPACTOR DATA REDUCTION

HP-67

Test No. 5/2-1d Date of Test 9-25-79 Engineer TIDONA

Sample Location #10 Blr. Out. Conditions Baseline

NOTE: Clear storage registers, then load program.

PRESS		Stage 1	2	3	4	5
STO 0	Estimated D_{50} (Stokes) diameter (CM)	0.0003	0.0001	0.0001	0.00005	0.00005
STO 1	D_j = jet diameter of stage (CM)	0.2490	0.1775	0.1396	0.0946	0.0731
STO 2	F_j = pressure factor of stage (N.D.)	0.0210	0.0273	0.0395	0.0903	0.3277
STO 3	ρ_p = density of particles (g/CM^3)	2.5	2.5	2.5	2.5	2.5

STO 4 μ = viscosity of flue gas (poise) 2.94×10^{-4}

STO 5 MW = molecular weight of flue gas (g/g-mole) 27.0

STO 6 ΔP_I = pressure drop across impactor (in.H_2O) 36.9

STO 7 P_S = absolute stack pressure (in. Hg) 30.29

STO 8 T_S = absolute stack temperature (°R) 1155

STO 9 Q_S = flow rate at stack conditions (ft^3/min) 0.110

NOTE: The following items are calculated for each Brink stage. After the first run through the program, only the first four items above need be input again for each succeeding stage.

		1	2	3	4	5
A	Calculate mean free path length, ℓ (CM)	2.44×10^{-5}	2.44×10^{-5}	2.44×10^{-5}	2.45×10^{-5}	2.51×10^{-5}
B	Calculate D_{50} (Stokes) diameter (μm)	2.39	1.33	0.845	0.364	0.187
C	Calculate D_{50} (Aerodynamic Impaction) diameter (μm)	4.23	2.55	1.77	0.987	0.663
D	Calculate D_{50} (Aerodynamic) diameter (μm)	3.94	2.26	1.49	0.710	0.394

KVB

BRINK IMPACTOR DATA REDUCTION

HP-67

Test No. 5/2-1f Date of Test 10-1-79 Engineer TIDONA

Sample Location #10 Blr. Out Conditions Baseline

NOTE: Clear storage registers, then load program.

PRESS		Stage 1	2	3	4	5
STO 0	Estimated D_{50} (Stokes) diameter (CM)	0.0003	0.0001	0.0001	0.00005	0.00005
STO 1	D_j = jet diameter of stage (CM)	0.2490	0.1775	0.1396	0.0946	0.0731
STO 2	F_j = pressure factor of stage (N.D.)	0.0210	0.0273	0.0395	0.0903	0.3277
STO 3	ρ_p = density of particles (g/CM^3)	2.5	2.5	2.5	2.5	2.5

STO 4 μ = viscosity of flue gas (poise) 2.93×10^{-4}

STO 5 MW = molecular weight of flue gas (g/g-mole) 27.0

STO 6 ΔP_I = pressure drop across impactor (in.H_2O) 91

STO 7 P_s = absolute stack pressure (in. Hg) 30.49

STO 8 T_s = absolute stack temperature (°R) 1152

STO 9 Q_s = flow rate at stack conditions (ft^3/min) 0.103

NOTE: The following items are calculated for each Brink stage. After the first run through the program, only the first four items above need be input again for each succeeding stage.

		1	2	3	4	5
A	Calculate mean free path length, ℓ (CM)	2.42×10^{-5}	2.42×10^{-5}	2.43×10^{-5}	2.45×10^{-5}	2.59×10^{-5}
B	Calculate D_{50} (Stokes) diameter (μm)	2.47	1.38	0.880	0.380	0.186
C	Calculate D_{50} (Aerodynamic Impaction) diameter (μm)	4.36	2.62	1.83	1.01	0.669
D	Calculate D_{50} (Aerodynamic) diameter (μm)	4.07	2.34	1.55	0.735	0.392

KVB

BRINK IMPACTOR DATA REDUCTION

HP-67

Test No. 5/2-4a Date of Test 10-3-79 Engineer TIDONA

Sample Location #10 Blr. Out. Conditions Low O_2

NOTE: Clear storage registers, then load program.

		Stage				
PRESS		1	2	3	4	5
STO 0	Estimated D_{50} (Stokes) diameter (CM)	0.0003	0.0001	0.0001	0.00005	0.00005
STO 1	D_j = jet diameter of stage (CM)	0.2490	0.1775	0.1396	0.0946	0.0731
STO 2	F_j = pressure factor of stage (N.D.)	0.0210	0.0273	0.0395	0.0903	0.3277
STO 3	ρ_p = density of particles (g/CM^3)	2.5	2.5	2.5	2.5	2.5

STO 4 μ = viscosity of flue gas (poise) 2.91×10^{-4}

STO 5 MW = molecular weight of flue gas (g/g-mole) 27.0

STO 6 ΔP_I = pressure drop across impactor (in.H_2O) 95

STO 7 P_S = absolute stack pressure (in. Hg) 30.46

STO 8 T_S = absolute stack temperature (°R) 1135

STO 9 Q_S = flow rate at stack conditions (ft^3/min) 0.0252

NOTE: The following items are calculated for each Brink stage. After the first run through the program, only the first four items above need be input again for each succeeding stage.

		1	2	3	4	5
A	Calculate mean free path length, ℓ (CM)	2.37×10^{-5}	2.37×10^{-5}	2.38×10^{-5}	2.40×10^{-5}	2.55×10^{-5}
B	Calculate D_{50} (Stokes) diameter (μm)	2.74	1.54	0.994	0.440	0.219
C	Calculate D_{50} (Aerodynamic Impaction) diameter (μm)	4.77	2.87	2.00	1.11	0.732
D	Calculate D_{50} (Aerodynamic) diameter (μm)	4.49	2.59	1.73	0.836	0.455

KVB

BRINK IMPACTOR DATA REDUCTION

HP-67

Test No. 5/7-2 Date of Test 10-17-79 Engineer TIDONA

Sample Location #10 Blr. Out. Conditions Low NO_x - "AA" Dpr Adjust.

NOTE: Clear storage registers, then load program.

PRESS		Stage 1	2	3	4	5
STO 0	Estimated D_{50} (Stokes) diameter (CM)	0.0003	0.0001	0.0001	0.00005	0.00005
STO 1	D_j = jet diameter of stage (CM)	0.2490	0.1775	0.1396	0.0946	0.0731
STO 2	F_j = pressure factor of stage (N.D.)	0.0210	0.0273	0.0395	0.0903	0.3277
STO 3	ρ_p = density of particles (g/CM^3)	2.5	2.5	2.5	2.5	2.5

STO 4 μ = viscosity of flue gas (poise) 2.90×10^{-4}

STO 5 MW = molecular weight of flue gas (g/g-mole) 27.0

STO 6 ΔP_I = pressure drop across impactor (in.H_2O) 105

STO 7 P_S = absolute stack pressure (in. Hg) 30.63

STO 8 T_S = absolute stack temperature (°R) 1120

STO 9 Q_S = flow rate at stack conditions (ft^3/min) 0.0955

NOTE: The following items are calculated for each Brink stage. After the first run through the program, only the first four items above need be input again for each succeeding stage.

	1	2	3	4	5
A Calculate mean free path length, ℓ (CM)	2.32×10^{-5}	2.32×10^{-5}	2.33×10^{-5}	2.36×10^{-5}	2.51×10^{-5}
B Calculate D_{50} (Stokes) diameter (μm)	2.58	1.45	0.928	0.407	0.199
C Calculate D_{50} (Aerodynamic Impaction) diameter (μm)	4.50	2.71	1.89	1.05	0.688
D Calculate D_{50} (Aerodynamic) diameter (μm)	4.23	2.44	1.62	0.777	0.416

KVB

BRINK IMPACTOR DATA REDUCTION

HP-67

Test No. 5/7-2a Date of Test 10-18-79 Engineer TIDONA

Sample Location #10 Blr. Out. Conditions Low NO_x - "AA" Dpr. Adjust

NOTE: Clear storage registers, then load program.

PRESS		Stage 1	2	3	4	5
STO 0	Estimated D_{50} (Stokes) diameter (CM)	0.0003	0.0001	0.0001	0.00005	0.00005
STO 1	D_j = jet diameter of stage (CM)	0.2490	0.1775	0.1396	0.0946	0.0731
STO 2	F_j = pressure factor of stage (N.D.)	0.0210	0.0273	0.0395	0.0903	0.3277
STO 3	ρ_p = density of particles (g/CM^3)	2.5	2.5	2.5	2.5	2.5

STO 4 μ = viscosity of flue gas (poise) 2.88×10^{-4}

STO 5 MW = molecular weight of flue gas (g/g-mole) 27.0

STO 6 ΔP_I = pressure drop across impactor (in.H_2O) 95

STO 7 P_s = absolute stack pressure (in. Hg) 29.87

STO 8 T_s = absolute stack temperature (°R) 1115

STO 9 Q_s = flow rate at stack conditions (ft^3/min) 0.087

NOTE: The following items are calculated for each Brink stage. After the first run through the program, only the first four items above need be input again for each succeeding stage.

	1	2	3	4	5
A Calculate mean free path length, ℓ (CM)	2.35×10^{-5}	2.35×10^{-5}	2.36×10^{-5}	2.39×10^{-5}	2.53×10^{-5}
B Calculate D_{50} (Stokes) diameter (μm)	2.70	1.52	0.977	0.432	0.213
C Calculate D_{50} (Aerodynamic Impaction) diameter (μm)	4.70	2.83	1.97	1.09	0.720
D Calculate D_{50} (Aerodynamic) diameter (μm)	4.42	2.55	1.70	0.821	0.445

KVB

BRINK IMPACTOR DATA REDUCTION

HP-67

Test No. 5/7-2b Date of Test 10-22-79 Engineer TIDONA

Sample Location #10 BLR. OUT. Conditions LOW NO_x - "AA" Dpr. Adjust.

NOTE: Clear storage registers, then load program.

PRESS		Stage 1	2	3	4	5
STO 0	Estimated D_{50} (Stokes) diameter (CM)	0.0003	0.0001	0.0001	0.00005	0.00005
STO 1	D_j = jet diameter of stage (CM)	0.2490	0.1775	0.1396	0.0946	0.0731
STO 2	F_j = pressure factor of stage (N.D.)	0.0210	0.0273	0.0395	0.0903	0.3277
STO 3	ρ_p = density of particles (g/CM^3)	2.5	2.5	2.5	2.5	2.5

STO 4 μ = viscosity of flue gas (poise) 2.84×10^{-4}

STO 5 MW = molecular weight of flue gas (g/g-mole) 27.0

STO 6 ΔP_I = pressure drop across impactor (in.H_2O) 105

STO 7 P_S = absolute stack pressure (in. Hg) 30.04

STO 8 T_S = absolute stack temperature (°R) 1096

STO 9 Q_S = flow rate at stack conditions (ft^3/min) 0.086

NOTE: The following items are calculated for each Brink stage. After the first run through the program, only the first four items above need be input again for each succeeding stage.

	1	2	3	4	5
A Calculate mean free path length, ℓ (CM)	2.26×10^{-5}	2.27×10^{-5}	2.27×10^{-5}	2.30×10^{-5}	2.46×10^{-5}
B Calculate D_{50} (Stokes) diameter (μm)	2.70	1.52	0.984	0.438	0.450
C Calculate D_{50} (Aerodynamic Impaction) diameter (μm)	4.69	2.82	1.97	1.09	0.716
D Calculate D_{50} (Aerodynamic) diameter (μm)	4.42	2.56	1.70	0.827	0.450

DATA SHEET NO. 60-35
4/80

KVB

SO$_x$ DATA SHEET (GOKSOYR-ROSS METHOD)

Test No. 5/2-11 Date 9-25-79 Location 5

Unit No. 10 Fuel HOGGED WOOD

Capacity 200000 LB stm/hr Unit Type HOGGED FUEL POWER BOILER

Engr. TIDONA Conditions BASELINE

Meter Finish 103.920

Meter Start 102.099

Sample Volume Collected = 1.821 ADCF – actual sample vol. = 1.456 ADCF

Start Time	Stop Time	Elapsed Time (minutes)
17:09	17:34	25

AVG. FLOW 0.073 DCFM (@ Tm, Pm)

Total Sampling Time = 25 min.

Time	Meter Vac. ("Hg)	Temperatures (°F)					Sample Flow Rate (ADCFM)
		Meter	Coil In	Coil Out	Water Bath	Stack	
17:17	0.0	95	138	141	169	712	0.074
17:21	0.0	96	138	137	177	712	0.075
17:29	0.0	96	136	150	178	712	0.075
17:33	0.0	97	136	153	177	712	0.093

NOTES: (1) Sample flow rate at meter should be 0.075 ADCFM or 0.01 cf/8 secs.

SUBTRACT 5 min X 0.073 cfm – DUE TO LEAK IN IMPINGER TRAIN

(2) Total sample volume collected should be ~1.5 cf (~ 20 minutes sampling time).

Data Sheet KVB 6015-37

DATE 3/19/80

KVB
A Research-Cottrell Company

TEST NO. 5/2-1d

SOx DATA SHEET

UNIT NO. 10 FUEL HOGGED FUEL LOAD 159000 #/hr LOCATION 5

Calculation: SO_3 or SO_2, ppm at stack O_2 = $\frac{(A - B) \times N \times F \times (460 + T) \times 24}{V (P + p)}$

Excess O_2 7.0 %

A = Ml of NaOH used for sample

B = Ml of NaOH used for blank

N = Normality of NaOH titrant

F = Dilution factor

T = Average temp. in gas meter, °F

V = Volume of gas sample, ft^3, dry @ T_m, P_m

P = Barometric pressure, in. Hg

p = Pressure in gas meter, in. Hg gage

	SO_2				SO_3				SO_x			
A =	0.25	0.30	0.65		0				0			
B =	0	0	0		0				0			
N =	0.0196	→	→		→				→			
F =	11.37	6.82	3.41		→				→			
T =	96°F				→				→			
V =	1.456				→				→			
P =	30.0				→				→			
p =	0.0				→				→			
Concentration, ppm at 3% O_2, dry =	22	15	17		0				0			
Average Concentration, ppm at 3% O_2, dry =	18				0				18			
lb/MBtu =	0.031				0				0.031			
ng/J =	13.5				0				13.5			

DATA SHEET NO. 60-14
Rev. 1/2/75
Rev. 2-3/25/80

LOCATION 6 - LIME KILN

ROTARY KILN DESIGN DATA

Location No. 6 **Unit No.** 1

Unit Description

Unit was a wet feed lime Kiln used in the chemical recovery cycle of a paper mill.

Installation Date	1975
Process Capacity	125 tons /Hr.
Burner Description	Steam Atomized Oil Burner
Test Fuel	#6 Oil
Combustion Air Temperature at Burner	Kiln Front End Temp. ≈ 2000°F (Matl.) Sec. Air temperature ~200°F
Length of Kiln	275'
Diameter of Kiln	11.5'

Comments:

MOBILE LABORATORY DATA

Test No.________

Test No. 6/1-1 to 3 Date 10/25/79 Location #6 Engr. [illegible]

Unit No.________ Fuel Oil (No. 6) Capacity 250 tons lime/day

Unit Type LIME KILN Burner Type No. 6 Tip

1. Test No.	6/1-1		6/1-1		6-/1-2		6/1-2		6/1-3	
2. Date	10/25/79		10/25		10/25					
3. Time	1140		1210		1300		1320		1335	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft 60 × 72										
7. Probe Position 31 deg										
8. Oxygen (%)	4.6		4.7		2.8		2.8		1.5	
9. NOx (hot) read/3% O_2 (ppm)*	69		66		73		64		10	
10. NO (hot) read/3% O_2 (ppm)*	67		63		70		61		8	
11. NO_2 (hot) read/3% O_2 (ppm)*	2		3		3		3		2	
12. NO (cold) read/3% O_2 (ppm)*	85	93	81	87	83	81	57	56	14	13
13. Carbon Dioxide (%)	19.2		20.5		20.5		20.5		20.5	
14. Carbon Monoxide (ppm) uncor/cor*	30	33	30	32	25	25	25	25	18	17
15. Hydrocarbon (ppm) uncor/cor*										
16. Sulfur Dioxide (ppm) uncor/cor*										
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	62		63		62		62		62	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.37		29.37		29.37		29.37		29.36	
21. Relative Humidity (%)										
22.										
23.	Base Line		Baseline		Medium O_2 Condition unstable		Med low O_2		Low O_2	
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.________

Test No. 6/1-4 Date 10-25-79 Location 6 Engr. Tidona

Unit No.________ Fuel No. 6 Oil Capacity 250 tpd

Unit Type LIME KILN Burner Type No. 6 Tip

1. Test No.	6/1-4									
2. Date	10/25/79									
3. Time	1215									
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft 60' 72'										
7. Probe Position 3' deep										
8. Oxygen (%)	6.5									
9. NOx (hot) read/3% O_2 (ppm)*	95									
10. NO (hot) read/3% O_2 (ppm)*	95									
11. NO_2 (hot) read/3% O_2 (ppm)*	0									
12. NO (cold) read/3% O_2 (ppm)*	129	160								
13. Carbon Dioxide (%)	183									
14. Carbon Monoxide (ppm) uncor/cor*	16	20								
15. Hydrocarbon (ppm) uncor/cor*										
16. Sulfur Dioxide (ppm) uncor/cor*										
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	62									
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.36									
21. Relative Humidity (%)										
22.										
23.										
24.										
25.	CO_2/									
26.										
27.	O_2									
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.________

Test No. 6/2-1 Date 10/25, 79 Location #6 Engr. Tidona

Unit No.________ Fuel No. 6 Oil Capacity 250 tpd

Unit Type LIME KILN Burner Type No. 6 Tip

1. Test No.	6/2-1		6-2-2		6/2 3					
2. Date										
3. Time	1440		1515		1545					
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft 60' x 72'										
7. Probe Position 31 deg										
8. Oxygen (%)	4.7		11.0		3.4					
9. NOx (hot) read/3% O_2 (ppm)*	82		97		126					
10. NO (hot) read/3% O_2 (ppm)*	81		95		125					
11. NO_2 (hot) read/3% O_2 (ppm)*	1		2		1					
12. NO (cold) read/3% O_2 (ppm)*	108	119	107	192	129	132				
13. Carbon Dioxide (%)	18.8		9.8		20.0					
14. Carbon Monoxide (ppm) uncor/cor*	18	20	10	18	15	15.3				
15. Hydrocarbon (ppm) uncor/cor*										
16. Sulfur Dioxide (ppm) uncor/cor*										
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	62		60		60					
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.36		29.37		29.37					
21. Relative Humidity (%)	Baseline Load									
22.										
23.			Low Fire							
24.					High Fire					
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 6/3-1 to 3

Test No. 6/3-1 to 3 Date 10/25/79 Location #6 Engr. Tidona

Unit No. ______ Fuel No. 6 Oil Capacity 250 tpd

Unit Type LIME KILN Burner Type No 6 Tip

1. Test No.	6/3-1		6/3·2		6/3-3		6/3-1			
2. Date	10/25/79		10/25		10.25		10/25			
3. Time										
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft 60" x 72"										
7. Probe Position 31" deep										
8. Oxygen (%)	4.0		3.9		3.2		3.8			
9. NOx (hot) read/3% O_2 (ppm)*	102		81		72		96			
10. NO (hot) read/3% O_2 (ppm)*	100		78		70		94			
11. NO_2 (hot) read/3% O_2 (ppm)*	2		3		2		2			
12. NO (cold) read/3% O_2 (ppm)*	107	113	87	92	76	77	99	104		
13. Carbon Dioxide (%)	19.2		18.6		20.5		18.9			
14. Carbon Monoxide (ppm) uncor/cor*	12	13	27	28	32	33	31	33		
15. Hydrocarbon (ppm) uncor/cor*										
16. Sulfur Dioxide (ppm) uncor/cor*										
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	60		60		60		60			
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.39		29.40		29.42		29.43			
21. Relative Humidity (%)										
22.	Baseline		Varied F/p ratio				Baseline			
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. [illegible] 1to5

Test No. 6/4-1to5 Date 10/26/79 Location #6 Engr. T.K.

Unit No. Lime Kiln Fuel #6 oil Capacity 250 tons per day

Unit Type Lime Kiln Burner Type No. 6 Oil Gun.

With Odor Gases

1. Test No.	6/4-1		6/4-2		6/4-3		6/4-4		6/4-5	
2. Date	10/26/79									
3. Time	1000		1050		1110		11[illegible]		1205	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft	72'x 60'									
7. Probe Position	31'									
8. Oxygen (%)	4.5		6.0		3.0		1.3		5.0	
9. NOx (hot) read/3% O_2 (ppm)*	107		167		68		54		89	
10. NO (hot) read/3% O_2 (ppm)*	105		162		65		53		88	
11. NO_2 (hot) read/3% O_2 (ppm)*	2		5		3		1		1	
12. NO (cold) read/3% O_2 (ppm)*	145	158	205	246	90	90	66	60	93	165
13. Carbon Dioxide (%)	20.5		18.0		21.0		22.0		20.5	
14. Carbon Monoxide (ppm) uncor/cor*	45	49	45	54	45	45	2370	2165	72	81
15. Hydrocarbon (ppm) uncor/cor*										
16. Sulfur Dioxide (ppm) uncor/cor*										
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	62		63		63		63		63	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.81		29.81		29.81		29.81		29.82	
21. Relative Humidity (%)										
22.										
23.									Baseline O_2 w/ secondary Air	
24.	w/ odor gases		Hi O_2		Med O_2		Low O_2			
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA Test No. 6/4-6 to 7

Test No. 6/4-6 to 7 Date 10/26/79 Location #6 Engr. Tilona

Unit No. Lime Kiln Fuel No. 6 oil Capacity 250 tons Per day

Unit Type Lime Kiln Burner Type No. 6 oil Gun

1. Test No.	6/4-6		6/4-1		6/4-7					
2. Date	10/26/79		10/26		10/26					
3. Time	1245		1300		1325					
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position										
8. Oxygen (%)	5.8		4.2		1.6					
9. NOx (hot) read/3% O_2 (ppm)*	94		139		115					
10. NO (hot) read/3% O_2 (ppm)*	92		138		112					
11. NO_2 (hot) read/3% O_2 (ppm)*	2		1		3					
12. NO (cold) read/3% O_2 (ppm)*	97	115	144	154	116	108				
13. Carbon Dioxide (%)	18.8		19.6		20.5					
14. Carbon Monoxide (ppm) uncor/cor*	52	62	50	54	77	71				
15. Hydrocarbon (ppm) uncor/cor*										
16. Sulfur Dioxide (ppm) uncor/cor*										
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	61		61		61					
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	29.80		29.79		29.78					
21. Relative Humidity (%)										
22.										
23.	HIGHT SECONDARY AIR									
24.			Base Line		NO ODOR GASES					
25.										
26.										
27.										
28.										
29.			no sec. air →							
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 6/5-6-1

Test No.________ Date 11/12/79 Location #6 Engr. Berning

Unit No. Lime Kiln Fuel #6 with odorant Capacity 250 tons per day

Unit Type________ Burner Type________

1. Test No.	6/5-1		6/6-1		6/6-2		6/6-3		6/6-4	
2. Date 11/12/79										
3. Time	1330		1445		1515		1600		1620	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft 60'x72'										
7. Probe Position 31" in										
8. Oxygen (%)	5.8		5.4		3.6		4.2		4.8	
9. NOx (hot) read/3% O_2 (ppm)*	64		84		66		65		74	
10. NO (hot) read/3% O_2 (ppm)*	63		81		65		62		71	
11. NO_2 (hot) read/3% O_2 (ppm)*	1		3		1		3		3	
12. NO (cold) read/3% O_2 (ppm)*	107	127	135	156	106	110	111	119	124	138
13. Carbon Dioxide (%)	20.5		20.5		20.5		20.5		20.5	
14. Carbon Monoxide (ppm) uncor/cor*	35	41	37	43	42	43	35	37	31	34
15. Hydrocarbon (ppm) uncor/cor*	30		33		22		18		15	
16. Sulfur Dioxide (ppm) uncor/cor*	50		40		57		38		110	
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	51		51		51		50		48	
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.85		30.86		30.85		30.85		30.84	
21. Relative Humidity (%)										
22.										
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No. 6/5-6-1

Test No.

Date 11/12/79

Location #6 Lime Kiln

Engr. Buening

Unit No. Lime Kiln

Fuel #6 oil: odc gas

Capacity 250 tons per day

Unit Type

Burner Type

1. Test No.	6/6-5		6/6·6		6/6·7					
2. Date 11/12/79										
3. Time	1645		1720		1745					
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft 60 x 72										
7. Probe Position 31 10										
8. Oxygen (%)	6.7		6.1		4.2					
9. NOx (hot) read/3% O_2 (ppm)*	84		74		68					
10. NO (hot) read/3% O_2 (ppm)*	83		73		67					
11. NO_2 (hot) read/3% O_2 (ppm)*	1		1		1					
12. NO (cold) read/3% O_2 (ppm)*	129	162	122	147	116	124				
13. Carbon Dioxide (%)	16.0		19.2		20.2					
14. Carbon Monoxide (ppm) uncor/cor*	34	43	33	40	34	36				
15. Hydrocarbon (ppm) uncor/cor*	16		20		12					
16. Sulfur Dioxide (ppm) uncor/cor*	105		95		44					
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	47		45		44					
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)	30.84		30.84		30.85					
21. Relative Humidity (%)										
22.										
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

UNIT OPERATING DATA

Test No. 6/1-1 to 4 **Date** 10-25-79 **Location** 6 **Test No:** 6/1-1 to 4

Unit No.________ **Fuel** No.6 OIL **Capacity** 137 tpd of lime (250 tpd future) 500 gph No.6 oil **Engr.** Tidona

Unit Type LIME KILN **Burner Type** No.6 Oil Gun

1. Test Number	6/1-1	6/1-1	6/1-2	6/1-3	6/1-4
2. Date	10-25-79	10-25-79	10-25-79	10-25-79	10-25-79
3. Time	12:00	12:43	13:28	13:41	14:12
4. Load					
5. Process Rate (gal. feed/min)	216	216	216	214	216
6. FUEL OIL FLOW (gph)	425	435	380	390	320
7. KILN HOOD DRAFT (iwg)	-0.05	-0.05	-0.05	-0.05	-0.06
8. OXYGEN (%)	2.1	2.0	1.1	0.0	4.9
9. TOTAL REDUCED SULFUR (ppm)	2	2	8	99	33 going down
10. KILN FRONT TEMP. (°F)	2050	2075	2200	2200	2200 going down
11. KILN SPEED (rpm)	1.2	1.2	1.2	1.2	1.2
12. KILN FEED END TEMP. (°F)	490	490	470	400	470
13. SCRUBBER ΔP (iwg)	28	29	22	16	23
14. FILTER FEED FLOW (gpm)	216	216	216	214	216
15. FUEL OIL INTEGRATOR (gal)	8043581	8043893	8044201	8044281	8044482
16. FUEL FLOW FROM INTGR.					
17. FUEL OIL PRESS. (psig)	72	74	65	67	52
18. ATOM. STM PRESS. (psig)	90	94	85	86	73
19. PRIMARY AIR FLOW (scfm)	2500	2600	1800	1750	3300
20. KILN FEED END DRAFT (iwg)	-0.3	-0.1	-0.4	-0.15	-0.15
21. PRIMARY AIR CTL	10	10	5	5	15
22. SECONDARY AIR CTL	40	55	20	0	15
23. FILTER FEED DENSITY (Baumé)	27.3	27.3	27.3	27.3	27.3
24.					
25.					
26.					
27.			MIN PRIMARY	MIN. TOTAL	
28.			AIR	AIR	
29.				LIME TEMP	
30.	BASELINE	——→		TOO HOT	
			MED LO O_2	LO O_2	HIGH O_2

MUD ANALYSIS

Data Sheet 6002-1

UNIT OPERATING DATA

Test No: 6/2-1&3

Test No. 6/2-1 to 3 **Date** 10-25-79 **Location** 6 **Engr.** Tidona

Unit No. ____ **Fuel** No.6 OIL **Capacity** 137 tpd of lime 500 gph No.6 oil

Unit Type LIME KILN **Burner Type** No.6 Oil Gun

1. Test Number	6/2-1	6/2-2	6/2-3		
2. Date	10-25-79	10-25-79	10-25-79		
3: Time	14:46	15:15	15:51		
4. Load					
5. Process Rate (gal feed/min)	216	216	216		
6. FUEL OIL FLOW (gph)	320	150	480		
7. KILN HOOD DRAFT (iwg)	-0.06	-0.055	-0.05		
8. OXYGEN (%)	2.3	9.7	1.9		
9. TOTAL REDUCED SULFUR (ppm)	25	14	30		
10. KILN FRONT TEMP. (°F)	2200	1820	1700		
11. KILN SPEED (rpm)	1.2	1.2	1.2		
12. KILN FEED END TEMP. (°F)	400	330	450		
13. SCRUBBER ΔP (iwg)	20	18	25		
14. FILTER FEED FLOW (gpm)	216	216	216		
15. FUEL OIL INTEGRATOR (gal)	8044670	8044758	8044947		
16. FUEL FLOW FROM INTGR.					
17. FUEL OIL PRESS. (psig)	51	20	87		
18. ATOM. STM. PRESS. (psig)	72	44	105		
19. PRIMARY AIR FLOW (scfm)	2600	2600	2600		
20. KILN FEED END DRAFT (iwg)	-0.35	-0.20	-0.25		
21. PRIMARY AIR CTL	10.5	10.5	10.5		
22. SECONDARY AIR CTL	2.5	5	100		
23. FILTER FEED DENSITY (Baumé)	27.2	27.2	27.2		
24.					
25.					
26.					
27.					
28.					
29.					
30.	BASELINE	LOW FIRE	HIGH FIRE		

Data Sheet 6002-1

UNIT OPERATING DATA Test No: 6/3-1

Test No. 6/3-1 Date 10-25-79 Location 6 Engr. Tidona

Unit No. _____ Fuel No. 6 OIL Capacity 137 tpd of lime 500 gph No. 6 oil

Unit Type LIME KILN Burner Type No. 6 Oil Gun

1. Test Number	6/3-1	6/3-2	6/3-3	6/3-1	
2. Date	10-25-79	10-25-79	10-25-79	10-25-79	
3. Time	16:29	17:49	19:05	18:21	
4. Load					
5. Process Rate (gal feed/min)	216	216	216	216	
6. FUEL OIL FLOW (gph)	320	310	320	315	
7. KILN HOOD DRAFT (iwg)	-0.055	-0.05	-0.05	-0.05	
8. OXYGEN (%)	2.0	2.5	0.9	1.9	
9. TOTAL REDUCED SULFUR (ppm)	37	44	55	54	
10. KILN FRONT TEMP. (°F)	2125	1950	1975	2000	
11. KILN SPEED (rpm)	1.2	1.2	1.2	1.2	
12. KILN FEED END TEMP. (°F)	370	375	340	340	
13. SCRUBBER ΔP (iwg)	15	16	14	15	
14. FILTER FEED FLOW (gpm)	216	216	216	216	
15. FUEL OIL INTEGRATOR (gal)	8045183	8045455	8045707	8045795	
16. FUEL FLOW FROM INTGR.					
17. FUEL OIL PRESS. (psig)	54	53	52	52	
18. ATOM. STM PRESS. (psig)	75	71	72	72	
19. PRIMARY AIR FLOW (scfm)	2500	1800	1200	2650	
20. KILN FEED END DRAFT (iwg)	-0.25	-0.20	-0.20	-0.15	
21. PRIMARY AIR CTL	10.5	5	3	11	
22. SECONDARY AIR CTL	0	10	5	0	
23. FILTER FEED DENSITY (Baumé)	27.2	27.2	27.2	27.2	
24.					
25.			(Lime quality		
26.			slightly degraded)		
27.					
28.					
29.		INCREASE	INC. S/P		
30.	BASELINE	S/P AIR RATIO	LOW O_2	BASELINE	

Smoky Fire

Data Sheet 6002-1

UNIT OPERATING DATA

Test No: 6/4-1 to 5

Test No. 6/4-1 to 5 Date 10-26-79 Location 6 Engr. Tidona

Unit No. ________ Fuel No. 6 OIL + ODOR GASES Capacity 137 tpd of lime 500 gph No. 6 oil

Unit Type LIME KILN Burner Type No. 6

1. Test Number	6/4-1	6/4-2	6/4-3	6/4-4	6/4-5
2. Date	10-26-79	10-26-79	10-26-79	10-26-79	10-26-79
3. Time	10:21	10:54	11:08	11:31	12:05
4. Load					
5. Process Rate	214	214	214	214	214
6. FUEL OIL FLOW (gph)	320	310	320	320	320
7. KILN HOOD DRAFT (iwg)	-0.05	-0.055	-0.055	-0.05	-0.055
8. OXYGEN (%)	2.2	4.3	1.0	0.0	2.2
9. TOTAL REDUCED SULFUR (ppm)	13	40	8	18	17
10. KILN FRONT TEMP. (°F)	2100	1880	2025	2175	2125
11. KILN SPEED (rpm)	1.2	1.2	1.2	1.2	1.2
12. KILN FEED END TEMP. (°F)	430	440	400	370	380
13. SCRUBBER ΔP (iwg)	23	25	21	22	25
14. FILTER FEED FLOW (gpm)	214	214	214	214	214
15. FUEL OIL INTEGRATOR (gal)	8052128	8052301	8052376	8052498	8052680
16. FUEL FLOW FROM INTGR.					
17. FUEL OIL PRESS. (psig)	56	56	56	53	58
18. ATOM. STM. PRESS. (psig)	77	76	76	74	78
19. PRIMARY AIR FLOW (scfm)	3950	4550	3200	1700	1650
20. KILN FEED END DRAFT (iwg)	-0.1	0.0	-0.1	-0.2	-0.1
21. PRIMARY AIR CTL	25	40	14	5	5
22. SECONDARY AIR CTL	0 (fan off)	————	————	————→	0
23. FILTER FEED DENSITY (Baumé)	27.6	27.0	27.6	28.4	27.6
24.	flame impinging on lime				
25.	no secondary		fire more	not much change	add sec. air
26.	air, flame		billowy, smoky	in flame	dpr leaks
27.	narrower than		no flame impinge-	Temp too high	even when closed
28.	with sec. air		ment	for good lime	flame looks same
29.				min. prim. air	————→
30.	BASELINE	HIGH O_2	MED LO O_2	LO O_2	BASELINE O_2 w/ SEC. AIR

Normal 11pm 5am Settings

Data Sheet 6002-1

UNIT OPERATING DATA

Test No: 6/4-6

Test No. 6/4-6 Date 10-26-79 Location 6 Engr. Tidona

Unit No. ______ Fuel No. 6 OIL +ODOR GASES Capacity 137 tpd of lime 500 gph No. 6 oil

Unit Type LIME KILN Burner Type No. 6

1. Test Number	6/4-6	6/4-1	6/4-7		
2. Date	10-26-79	10-26-79	10-26-79		
3. Time	12:46	13:03	13:29		
4. Load					
5. Process Rate	216	216	216		
6. FUEL OIL FLOW (gph)	310	320	320		
7. KILN HOOD DRAFT (iwg)	-0.055	-0.055	-0.055		
8. OXYGEN (%)	3.8	2.2	0.0		
9. TOTAL REDUCED SULFUR (ppm)	16	15	16		
10. KILN FRONT TEMP. (°F)	2020	1980	2180		
11. KILN SPEED (rpm)	1.2	1.2	1.2		
12. KILN FEED END TEMP. (°F)	400	380	340		
13. SCRUBBER ΔP (iwg)	26	23	20		
14. FILTER FEED FLOW (gpm)	216	216	216		
15. FUEL OIL INTEGRATOR (gal)	8052901	8052993	8053135		
16. FUEL FLOW FROM INTGR.					
17. FUEL OIL PRESS. (psig)	56	56	56		
18. ATOM. STM PRESS. (psig)	76	76	76		
19. PRIMARY AIR FLOW (scfm)	1700	3950	4000		
20. KILN FEED END DRAFT (iwg)	-0.15	-0.20	-0.05		
21. PRIMARY AIR CTL	5	24	25		
22. SECONDARY AIR CTL	7	0 (fan off)	⟶		
23. FILTER FEED DENSITY (Baumé)	27.8	27.6	27.5		
24.					
25.	flame less smoky				
26.			short flame		
27.					
28.			CONST. PRIM. AIR		
29.		REPEAT	NO		
30.	HIGH SEC. AIR	BASELINE	ODOR GASES		

Data Sheet 6002-1

UNIT OPERATING DATA **Test No:**

Test No. **Date** 11-12-79 **Location** 6 **Engr.** K.

Unit No. **Fuel** No. 6 OIL + Odor Gas **Capacity** 137 tpd of lime 500 gph No. 6 oil

Unit Type LIME KILN **Burner Type** No. 6

1. Test Number	6/5-1	6/6-1	6/6-2	6/6-3	6/6-4
2. Date	11-12-79	11-12-79	11-12-79	11-12-79	11-12-79
3. Time	13:30	14:45	15:20	16:00	16:30
4. Load					
5. Process Rate Gal of Feed/min	150	150	150	150	150
6. FUEL OIL FLOW (gph)	350	350	300	300	300
7. KILN HOOD DRAFT (iwg)	-.05	-.05	-.05	-.05	-.05
8. OXYGEN (%)	5.2	4.5	2.2	3.4	4.0
9. TOTAL REDUCED SULFUR (ppm)	0	0	0	0	0
10. KILN FRONT TEMP. (°F)	2020	2160 to >2200	>2200	2150	2170
11. KILN SPEED (rpm)	1.2	1.2	1.2	1.2	1.2
12. KILN FEED END TEMP. (°F)	520	490	385	375	420
13. SCRUBBER ΔP (iwg)	26	25	20	20	21
14. FILTER FEED FLOW (gpm)	150	150	150	150	150
15. FUEL OIL INTEGRATOR (gal)	8185127	8185487	8185672	8185891	8186025
16. FUEL FLOW FROM INTGR.	—	—	—	—	—
17. FUEL OIL PRESS. (psig)	56	70	64	61	61
18. ATOM. STM PRESS. (psig)	74	87	83	81	81
19. PRIMARY AIR FLOW (scfm)	2500	2500	2600	3400	3900
20. KILN FEED END DRAFT (iwg)	-.1	-.1	-.1	-.1	-.1
21. PRIMARY AIR CTL	10	10	10	15	18.5
22. SECONDARY AIR CTL	5	5	0 Fan off	0 Fan off	0 Fan off
23. FILTER FEED DENSITY (Baumé)	31	31	31	31	31
24.					
25.					
26.	Baseline old nozzle with odor gas	Baseline new nozzle with odor gas	Second. air off Low O2 w. odor gas	Second. air off High O2 No odor gas	Second. air off Highest O2 No odor gas
27.					
28.					
29.					
30.					

Data Sheet 6002-1

UNIT OPERATING DATA

Test No: ________

Test No. ________ Date 11-12-79 Location 6 Engr. K.

Unit No. Lime Kiln Fuel No. 6 OIL Capacity 137 tpd of lime 500 gph No. 6 oil

Unit Type LIME KILN Burner Type No. 6

1. Test Number	6/6-5	6/6-6	6/6-7		
2. Date	11-12-79	11-12-79	11-12-79		
3. Time	16:45	17:25	17:45		
4. Load					
5. Process Rate	150	150	150		
6. FUEL OIL FLOW (gph)	300	300	300		
7. KILN HOOD DRAFT (iwg)	-.05	-.05	-.05		
8. OXYGEN (%)	6.0	5.3	3.1		
9. TOTAL REDUCED SULFUR (ppm)	0	0	0		
10. KILN FRONT TEMP. (°F)	2160	2090	2140		
11. KILN SPEED (rpm)	1.2	1.2	1.2		
12. KILN FEED END TEMP. (°F)	430	420	410		
13. SCRUBBER ΔP (iwg)	24	29	27		
14. FILTER FEED FLOW (gpm)	150	150	150		
15. FUEL OIL INTEGRATOR (gal)	8186126	8186310	8186445		
16. FUEL FLOW FROM INTGR.	—	-	-		
17. FUEL OIL PRESS. (psig)	61	61	61		
18. ATOM. STM PRESS. (psig)	81	81	81		
19. PRIMARY AIR FLOW (scfm)	2600	2000	2600		
20. KILN FEED END DRAFT (iwg)	-.15	-.1	-.15		
21. PRIMARY AIR CTL	10	7	10		
22. SECONDARY AIR CTL	0 Fan on	0 Fan on	0 Fan on		
23. FILTER FEED DENSITY (Baumé)	31	31	31		
24.					
25.	Second air on. Damper closed Odor gas on	Second air on Low Prim. air Odor gas on	Odor Gas off		
26.					
27.					
28.					
29.					
30.					

Data Sheet 6002-1

SITE 6 FUEL ANALYSES

Sample Identification:

1. Wood fuel sample Loc.5 9-20-79 Test 5/2-1b
2. Wood fuel sample Loc.5 10-3-79 Test 5/2-4a
3. Wood fuel sample Loc.5 10-17-79 Test 5/7-2
4. Bottom ash Loc. 5 10-3-79 Test 5/2-4a
5. Bottom ash Loc. 5 10-17-79 Test 5/7-2
6. Bottom ash Loc. 5 9-20-79 Test 5/2-1b
7. Multiclone Hopper ash Loc. 5 9-20-79 Test 5/2-1b
8. Multiclone Hopper ash Loc. 5 10-3-79 Test 5/2-4a
9. Multiclone Hopper ash Loc. 5 10-17-79 Test 5/7-2
10. No. 6 Fuel Oil Loc. 5 9-13-79 Test 5/1-1
11. No. 6 Fuel Oil Loc. 5 10-23-79 Test 5/7-2C use for first set of [illegible] data

Wood Fuel samples:

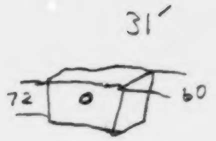
Proximate Analysis:	1	2	3
Moisture, %	51.76	44.64	50.05
Volatile Matter, %	37.59	42.27	38.29
Ash, %	2.55	3.64	2.02
Fixed Carbon, %	8.10	9.45	9.64

Ultimate Analysis (Dry Basis):	wt ash-free	wt	1	2	3
Carbon, %	24.01	22.74	47.13	48.53	49.81
Hydrogen, %	2.88	2.73	5.66	5.50	5.69
Nitrogen, %	.08	.08	0.16	0.21	0.27
Sulfur, %	.05	.05	0.11	0.088	0.091
Ash, %			5.29	6.57	4.04
Oxygen, % (by difference)			41.65	39.10	40.10
Heat of Combustion (Dry Basis):					
Gross BTU/lb		3959	8207	8438	8674

No. 6 Fuel Oils

	10	11
Ultimate Analysis:		
Carbon, %	89.21	89.69
Hydrogen, %	8.27	7.65
Nitrogen, %	0.45	0.39
Sulfur, %	1.52	1.71
Ash, %	0.019	0.030
Oxygen, % (by difference)	0.53	0.53
Heat of Combustion:		
Gross BTU/lb	17,550	17,220
Net BTU/lb	16,800	16,520
API Gravity at 60°F	2.3	< 0.7

KVB



C~ = .075

SO$_x$ DATA SHEET (GOKSOYR-ROSS METHOD)

Test No. 6/1-1 Date 10-25-79 Location 6

Unit No. ______ Fuel LIQUOR GASES, OIL

Capacity ______ Unit Type LIME KILN

Engr. TIDONA Conditions ______

Meter Finish 939.420

Meter Start 927876

Sample Volume Collected = 1.544 ADCF

Start Time	Stop Time	Elapsed Time (minutes)
12:00	12:20	20.0

Total Sampling Time = ______ min.

Time	Meter Vac. ("Hg)	Temperatures (°F)					Sample Flow Rate (ADCFM)
		Meter	Coil In	Coil Out	Water Bath	Stack	
1206	0		84	88	172	475	.075
12:10	0		98	98	172	475	
12:15	0	929.140	98	93	167	475	
12:20	0	939.420	93	89	166	475	
		1.544					

NOTES: (1) Sample flow rate at meter should be 0.075 ADCFM or 0.01 cf/8 secs.

(2) Total sample volume collected should be ~1.5 cf (~ 20 minutes sampling time).

A Research-Cottrell Company Data Sheet KVB 6015-37

KVB

A Research-Cottrell Company

DATE__________ TEST NO. 6/1-1

SOx DATA SHEET

UNIT NO.____ FUEL No. 6 OIL LOAD________ LOCATION 6

Calculation: SO_3 or SO_2, ppm at stack O_2 = $\frac{(A - B) \times N \times F \times (460 + T) \times 24}{V\ (P + p)}$

Excess O_2 4.4 %

A = Ml of NaOH used for sample

B = Ml of NaOH used for blank

N = Normality of NaOH titrant

F = Dilution factor

T = Average temp. in gas meter, °F

V = Volume of gas sample, ft^3

P = Barometric pressure, in. Hg

p = Pressure in gas meter, in. Hg gage

	SO_2				SO_3				SO_x			
A =	0.20				0							
B =	0				0							
N =	.0196				.0196							
F =	5.12				1							
T =	80				80							
V =	1.544				1.544							
P =	29.37				29.37							
p =	0				0							
Concentration, ppm at 3% O_2, dry =	6.2				0							
Average Concentration, ppm at 3% O_2, dry =	6.2				0				6.2			
lb/MBtu =	0.011				0				0.011			
ng/J =	4.9				0				4.9			

DATA SHEET NO. 60-14
Rev. 1/2/75
Rev. 2-3/25/80

LOCATION 8 - PREHEATER/PRECALCINER CEMENT KILN

ROTARY KILN DESIGN DATA

Location No. 8 **Unit No.** —

Unit Description PREHEATER/PRECALCINER ROTARY CEMENT KILN

Installation Date	1980
Process Capacity	30 Kg/s (120 tons/h) FEED
Burner Description	PULVERIZED COAL BURNER
Test Fuel	COAL
Combustion Air Temperature at Burner	PRIMARY AIR T = 378K (220°F); SEC. AIR T = 922K (1200°F)
Length of Kiln	61m (200 ft)
Diameter of Kiln	

Comments: SAMPLING LOCATION AT STACK

MOBILE LABORATORY DATA Test No. SITE 8

Test No.______ Date 8/6/80 Location SITE 8 Engr. TIDONA

Unit No.______ Fuel COAL Capacity______

Unit Type PRECALCINER CEMENT KILN Burner Type Fuller COAL BURNER

1. Test No.	8/1-1		8/1-1		8/1-1		8/1-1			
2. Date	8/6/80		8/6/80		8/6/80		8/6/80		8/6/80	
3. Time	16:00		16 15		16 30		17:15			
4. Load										
5. Process Rate (tons/h Kiln feed)	120		→							
6. Flue Diam. or Size, ft										
7. Probe Position	CNTR		→							
8. Oxygen (%)	14.0%		N/A (~13.5)		N/A (~13.5)		13.0			
9. NOx (hot) read/3% O_2 (ppm)*	500		515		505		490			
10. NO (hot) read/3% O_2 (ppm)*	500		515		505		490			
11. NO_2 (hot) read/3% O_2 (ppm)*	0		0		0		0			
12. NO (cold) read/3% O_2 (ppm)*	570	1466	600	1440	600	1440	505	1136		
13. Carbon Dioxide (%)	3.4 ?		3.8 ?		4.1 ?		12.8			
14. Carbon Monoxide (ppm) uncor/cor*	100	257	100	240	100	240	100	225		
15. Hydrocarbon (ppm) uncor/cor*	—		—		—		—			
16. Sulfur Dioxide (ppm) uncor/cor*	20	55	20	51	20	51	20	48		
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	95°F		95°F		92°F		93°F			
19. Dew Point Temp. (°F/°C)							73.5°F			
20. Atmos. Pressure (in. Hg)					29.41		29.41			
21. Relative Humidity (%)	46%		46 %		45%		40%			
22.										
23. 110 tons/hr COND:										
24. Kiln feed rate										
25. COMMENT:										
26.										
27. Use 6.5% H_2O										
28. to convert to dry										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.

Test No. 8/1-1P Date 8-7-80 Location 8 Engr. TIDONA

Unit No. Fuel COAL Capacity

Unit Type PRECALCINER KILN Burner Type

1. Test No.	8/1-1P		8/1-1P		8/1-1P		8/1-1P		8/1-1P	
2. Date	8-7-80		8-7-80		8-7-80		8-7-80		8-7-8	
3. Time	08:40		12:10		13:25		13:50		14:00	
4. Load										
5. Process Rate (tons/h Kiln feed)	110		110		110		110		110	
6. Flue Diam. or Size, ft	10.3		→							
7. Probe Position	STACK CENTER		→		Kiln Outlet		Alkali Baghouse Inlet		Alkali Baghouse OUTLET	
8. Oxygen (%)	15.5 14.0		15.5 12.7		5.8		20.5		20.75	
9. NOx (hot) read/3% O_2 (ppm)*	440		505		–		–		–	
10. NO (hot) read/3% O_2 (ppm)*	440		505		–		–		–	
11. NO_2 (hot) read/3% O_2 (ppm)*	0		0		–		–		–	
12. NO (cold) read/3% O_2 (ppm)*	500	1286	520	1128	770	912	170		110	
13. Carbon Dioxide (%)	13.8		13.8		20.0		1.6		1.0	
14. Carbon Monoxide (ppm) uncor/cor*	130	334	160	347	10	12	0	0	0	0
15. Hydrocarbon (ppm) uncor/cor*	–		–		–		–		–	
16. Sulfur Dioxide (ppm) uncor/cor*	0	0	0	0	0	0	0	0	0	0
17. Smoke Spot (Bacharach)	–		–							
18. Atmos. Temp. (°F/°C)	74		89		93		→			
19. Dew Point Temp. (°F/°C)	72		76		75		→			
20. Atmos. Pressure (in. Hg)	29.45		29.45		29.44		→			
21. Relative Humidity (%)	91		55		44		→			
22.										
23.										
24.										
25.							High O_2			
26.							O_2 CO_2 and			
27.							NO swinging			
28.							about mean			
29.							Values obk			
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.________

Test No. 8/1-1P Date 8-7-80 Location 8 Engr. TIDONA

Unit No.__________ Fuel COAL Capacity__________

Unit Type PRECALCINER KILN Burner Type__________

1. Test No.	8/1-1P		8/1-1P							
2. Date	8-7-80		8-7-80							
3. Time	14:20		16:25							
4. Load										
5. Process Rate (tons/hr kiln feed)	110		110		110					
6. Flue Diam. or Size, ft										
7. Probe Position	Crusher Dryer Baghouse Outlet		Stack center		Flash furnace Outlet					
8. Oxygen (%)	11.5		13.5		10.0					
9. NOx (hot) read/3% O_2 (ppm)*	–		550							
10. NO (hot) read/3% O_2 (ppm)*	–		550							
11. NO_2 (hot) read/3% O_2 (ppm)*	–		–							
12. NO (cold) read/3% O_2 (ppm)*	570	1080	555	1332						
13. Carbon Dioxide (%)	16.2		13.6							
14. Carbon Monoxide (ppm) uncor/cor*	200	379	160	384						
15. Hydrocarbon (ppm) uncor/cor*	–		–							
16. Sulfur Dioxide (ppm) uncor/cor*	0	0	0							
17. Smoke Spot (Bacharach)	–		–							
18. Atmos. Temp. (°F/°C)	92		95							
19. Dew Point Temp. (°F/°C)	74		73							
20. Atmos. Pressure (in. Hg)	29.42		29.37							
21. Relative Humidity (%)	43		35							
22.										
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.________

Test No. 8/1-1G Date 8-8-80 Location 8 Engr. TIDONA

Unit No.________ Fuel COAL Capacity________

Unit Type PRECALCINER KILN Burner Type________

1. Test No.	8/1-1G		8/1-1A		8/1-1A		8/1-1A		8/1-1A	
2. Date	8-8-80.		8-8-80		8-8-80		. 8-8-80		8-8-80	
3. Time	11:30		14:10		14:40		16:10		17:35	
4. Load										
5. Process Rate (tons/hr kiln feed)	120		120		120		120			
6. Flue Diam. ft	10.3'		10.3'						10.3'	
7. Probe Position	Stack Center		→		Alkali Baghouse Outlet		C.D. Baghouse Outlet		Stack Center	
8. Oxygen (%)	13.1		12.5		20.8		11.5		13.0	
9. NOx (hot) read/3% O_2 (ppm)*	500		445		–		–		460	
10. NO (hot) read/3% O_2 (ppm)*	500		445		–		–		460	
11. NO_2 (hot) read/3% O_2 (ppm)*	0		0		–		–		–	
12. NO (cold) read/3% O_2 (ppm)*	515	1173	475	1006	90		485	919	480	1030
13. Carbon Dioxide (%)	15.0		15.5		1.3		17.2		14.0	
14. Carbon Monoxide (ppm) uncor/cor*	160	365	180	381	0	0	170	322	170	383
15. Hydrocarbon (ppm) uncor/cor*	–		–		–		–		–	
16. Sulfur Dioxide (ppm) uncor/cor*	10	24	10	22	0	0	10	20	0	0
17. Smoke Spot (Bacharach)	–		–		–		–		–	
18. Atmos. Temp. (°F/°C)	87		92		–		99		97.5	
19. Dew Point Temp. (°F/°C)	76		76		–		73		75	
20. Atmos. Pressure (in. Hg)	29.37		29.33		29.32		29.29		29.27	
21. Relative Humidity (%)	61		48		–		28		35	
22.										
23.										
24.	GOKSOYR-		ANDERSEN							
25.	ROSS (SOx)		TEST							
26.	TEST									
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.________

Test No. 8/1-1A Date 8-8-80 Location 8 Engr. TIDONA

Unit No.________ Fuel COAL Capacity________

Unit Type PRECALCINER KILN Burner Type________

1. Test No.	8/1-1A				
2. Date	8-8-80	8-8-80	8-8-80		
3. Time	18:00	–	22:00		
4. Load					
5. Process Rate (tons/hr Kiln feed)	120	120	115		
6. Flue Diam. or Size, ft	10.3'				
7. Probe Position	Alkali Baghouse Inlet	Kiln Outlet	F.C. Outlet		
8. Oxygen (%)	20.5	1.0	8.5		
9. NOx (hot) read/3% O_2 (ppm)*	—				
10. NO (hot) read/3% O_2 (ppm)*	–				
11. NO_2 (hot) read/3% O_2 (ppm)*	–				
12. NO (cold) read/3% O_2 (ppm)*	150				
13. Carbon Dioxide (%)	1.1				
14. Carbon Monoxide (ppm) uncor/cor*	0				
15. Hydrocarbon (ppm) uncor/cor*	—				
16. Sulfur Dioxide (ppm) uncor/cor*	0				
17. Smoke Spot (Bacharach)	–				
18. Atmos. Temp. (°F/°C)	97.5				
19. Dew Point Temp. (°F/°C)	75				
20. Atmos. Pressure (in. Hg)	29.27				
21. Relative Humidity (%)	35				
22.					
23.		from	O_2 from		
24.		Orsat	Teledyne		
25.		Analysis	reg. using		
26.		by Baker	glass		
27.			probe		
28.					
29.					
30.					

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

LOCATION 8
SUMMARY OF PROCESS DATA, CEMENT PLANT

Day	Time	Kiln Feed (TPH)	Coal Feed (TPH)	Crusher/Dryer (on/off)	Combustion Air Temperatures Kiln-Primary (°F)	Combustion Air Temperatures Furnace-Secondar (°F)
8/6/80	10:00	--	--	On	220	1250
	11:00	92.8	7.4	Off	220	1050
	12:00	101.1	8.5	Off	220	1200
	13:00	91.7	7.3	On	220	1250
	15:00[1]	97.0	7.7	On	220	1250
	16:00	96.9	8.1	On	220	1200
	17:00	92.7	6.8	On	220	1250
Avg.		95.4	7.6		220	1207
8/7/80	8:00	--	--	On	220	1180
	9:00	96.9	8.8	Off	220	1200
	10:00	103.4	8.2	On	220	1220
	11:00	104.9	8.2	On	220	1250
	12:00	104.2	7.6	On	220	1250
	13:00	118.3	8.7	On	220	1250
	14:00	93.2	7.0	On	220	1320
	15:00	106.5	8.1	On	220	1300
	16:00	104.0	8.1	On	220	1280
	17:00	110.0	8.0	On	220	1300
Avg.		104.6	8.1		220	1255
8/8/80	8:00	--	--	On	220	1280
	9:00	108.6	8.3	On	220	1250
	10:00	116.2	9.0	On	220	1280
	11:00	120.2	9.3	On	220	1310
	12:00	110.8	8.6	On	220	1270
	13:00	109.3	8.5	Off	220	1290
	14:00	115.8	9.0	On	220	1310
	15:00	112.0	9.2	On	215	1305
	16:00	115.6	7.1	On	215	1360
	17:00	116.5	7.1	On	215	1240
Avg.		113.9	8.5		219	1290

1 - No Reading at 14:00

LOCATION 8, Summary of Process Data
Cement Plant

		PROCESS TEMPERATURES[2]					BAGHOUSE TEMPER:	
Day	Kiln .In (°F) ↓	Furnace (°F)	Stage IV (°F)	Stage III (°F)	Stage II (°F)	Stage I (°F)	Crusher/Dryer (°F)	Alkali Bypass (°F)
8/6	1870	1620	1530	1425	1250	670	460	290
	1860	1575	1520	1410	1200	670	460	290
	1850	1560	1520	1410	1200	670	460	320
	1840	1540	1520	1400	1180	670	395	330
	1860	1560	1520	1410	1180	670	440	320
	1760	1550	1520	1400	1160	650	400	310
	1800	1550	1520	1400	1180	650	360	300
Avg.	1850	1565	1521	1408	1193	664	425	311
8/7	1930	1610	1520	1440	1230	680	390	300
	1930	1570	1520	1420	1190	670	460	270
	1930	1570	1520	1420	1170	650	390	280
	1900	1570	1520	1430	1170	660	390	280
	1880	1570	1520	1420	1160	650	390	280
	1870	1570	1520	1400	1150	710	385	290
	1890	1560	1520	1380	1150	710	410	275
	1860	1580	1520	1400	1170	710	445	290
	1920	1600	1520	1400	1160	660	440	280
	1920	1560	1520	1400	1150	710	440	290
Avg.	1902	1576	1520	1411	1170	681	414	284
8/8	1900	1570	1520	1380	1150	650	410	300
	1900	1590	1520	1400	1150	660	400	290
	1900	1570	1520	1400	1140	710	460	310
	1900	1580	1520	1400	1140	710	460	250
	1930	1560	1520	1410	1160	710	455	260
	1920	1570	1520	1400	1150	710	480	290
	1410	1570	1520	1400	1140	715	450	270
	1900	1560	1520	1365	1125	710	450	275
	1910	1530	1520	1375	1160	705	470	300
	1900	1560	1520	1400	1160	705	450	260
Avg.	1980	1566	1520	1393	1148	699	449	281

[2] - Exit Conditions

COAL FUEL ANALYSES FOR LOCATION 8

Test 8/1-1
AUGUST 6, 1980

PROXIMATE ANALYSIS

	As Rec'd.	Dry Basis
%Moisture	2.16	xxxxx
%Ash	12.78	13.06
%Volatile	33.82	34.57
%Fixed Carbon	51.24	52.37
	100.00	100.00
Btu/lb.	12491	12767
%Sulfur	1.90	1.94

ULTIMATE ANALYSIS

	As Rec'd	Dry Basis
%Moisture	2.16	xxxxx
%Carbon	69.77	71.31
%Hydrogen	4.82	4.93
%Nitrogen	1.62	1.66
%Chlorine	0.04	0.04
%Sulfur	1.90	1.94
%Ash	12.78	13.06
%Oxygen(diff)	6.91	7.06
	100.00	100.00

Test 8/1-1P
AUGUST 7, 1980

PROXIMATE ANALYSIS

	As Rec'd.	Dry Basis
%Moisture	2.14	xxxxx
%Ash	10.80	11.04
%Volatile	34.75	35.51
%Fixed Carbon	52.31	53.45
	100.00	100.00
Btu/lb.	12878	13160
%Sulfur	1.90	1.94

ULTIMATE ANALYSIS

	As Rec'd	Dry Basis
%Moisture	2.14	xxxxx
%Carbon	71.45	73.01
%Hydrogen	4.89	5.00
%Nitrogen	1.57	1.60
%Chlorine	0.04	0.04
%Sulfur	1.90	1.94
%Ash	10.80	11.04
%Oxygen(diff)	7.21	7.37
	100.00	100.00

Tests 8/1-1G and 8/1-1A
AUGUST 8, 1980

PROXIMATE ANALYSIS

	As Rec'd.	Dry Basis
%Moisture	2.05	xxxxx
%Ash	12.54	12.80
%Volatile	34.39	35.11
%Fixed Carbon	51.02	52.09
	100.00	100.00
Btu/lb.	12662	12927
%Sulfur	2.09	2.13

ULTIMATE ANALYSIS

	As Rec'd	Dry Basis
%Moisture	2.05	xxxxx
%Carbon	70.45	71.92
%Hydrogen	4.88	4.98
%Nitrogen	1.34	1.37
%Chlorine	0.04	0.04
%Sulfur	2.09	2.13
%Ash	12.54	12.80
%Oxygen(diff)	6.61	6.76
	100.00	100.00

HP-67 KEYED CALCULATION SHEET*

PARTICULATE EMISSION CALCULATIONS

Test No. 8/1-1P Date 8-7-80 Location 8 Engr. TIDONA

Unit No. ________ Fuel COAL Sampling Train and Method JOY, METHOD 5

Pitot Factor, Fs .837 Barometric Pressure, P_{bar} 29.45 (STO 0) in. Hg

114.6

Tot. Liquid Collected, V_{1c} 127.6 (STO 1) ml Total Particulate, M_n ________ (STO 2) m gm 70.8

Velocity Head, ΔP 0.42 (STO 3) iwg Stack Temp., Ts 326 (STO 4) °F Stack Area, As 83.86 (STO 5) ft^2

Sample Volume, Vm 67.91 (STO 6) ft^3 Stack Press., Psg -0.36 (STO 7) iwg Excess O_2, XO_2% 13.4 (STO 8) %

Orifice Press. Diff., H 0.81 (STO 9) iwg Stack Gas Sp. Gravity, Gs 1.0 (STO A) n.d.

Sample Time, θ 110 (STO B) min Nozzle Dia., Dn 0.245 (STO C) in. Meter Temp., T_m 101 (STO D) °F

Select F_e	Oil (A)	Gas (B)	Coal (C)	Other: [illegible]
SC Feet/10^4 Btu	92.2	87.4	98.2	1. [illegible] (_)

Press (E) if meter is not temperature compensated.

1. Sample Gas Volume $Vm_{std} = 0.0334\ Vm(P_{bar} + H/13.6)$ 63.2348 SCF
2. Water Vapor $Vw_{std} = 0.0474\ V_{1c}$ 6.0482 SCF
3. Moisture Content $Bwo = Eq.\ 2/(Eq.\ 1 + Eq.\ 2)$ 0.0873 N.D.
4. Concentration a. $C = 0.0154\ Mn/Vm_{std}$ 0.0279 grains/DSCF

   b. $C = 2.205 \times 10^{-6}\ Mn/Vm_{std}$ 4.00×10^{-6} lb/DSCF

   c. $C = Eq.\ 4b \times 16.018 \times 10^3$ 0.0640 grams/DSCM
5. Abs. Stack Press. $Ps = P_{bar} \times 13.6 + Psg$ 400.16 in. w abs.
6. Stack Gas Speed $Vs = 174\ Fs\ \sqrt{\Delta P Ts}\sqrt{\frac{407}{Ps} \times \frac{1.00}{Gs}}$ 2646 ft/min
7. Stack Gas Flow Rate @ 70°F a. $Qsw = Eq.\ 6 \times As \times \frac{530}{Ts} \times \frac{Ps}{407}$ 147105 WSCF/min

   b. $Qsd = Eq.\ 7a \times (1. - Eq.\ 3)$ 34263 DSCF/min
8. Material Flow $Ms = Eq.\ 7b \times Eq.\ 4b \times 60$ 32.196 lb/hr
9. XO_2 factor $XO_2f = 2090/(20.9 - XO_2\%)$ 278.6667 N.D.
10. Emission a. $E = Eq.\ 4b \times Fe \times Eq.\ 9$ 0.1434 lb/MMBtu

    b. $E = Eq.\ 4c \times Fm \times Eq.\ 9 \times 1000$ 61.668 ng/joule
11. % Isokinetic $I = \frac{14077 \times Ts(Vm_{std} + Vw_{std})}{\theta \times Vs \times Ps \times Dn^2}$ 109.64 %

$$\frac{32.196\ lb/hr \times 453.59\ g/lb}{240\ [illegible]/hr\ Feed \times .7 \times 0.454\ Kg/lb} = 0.1816\ g/Kg\ [illegible]$$

*If calculating by hand:
1) Convert T_s and T_m to °R
2) Multiply EQ 1 by $530/T_m$(°R) if meter not temperature compensated.
3) $F_m = 2.684 \times 10^{-5} \times F_e$

Data Sheet 6002-4
Revised 2/15/78

PARTICULATE CALCULATION SHEET

Test No. 8/1-1P (Inlet, Outlet)
Location S-I 8
Box No.
Test Date 8/[illegible]
Test Description: PARTICULATE

Dry Gas Meter Vol (ft3) FILTER #109
BLANK - #108
Final 1981.63
Initial 1913.72
Total 67.91

Impinger Water Vol (ml)

	1	2	3	Total	[illegible]
Final	192	118	2	792.2	480.2
Initial	100	100	0		464.6
△ Vol	92	18	2	127.6	15.6

							Filter No.	Blank No.
Beaker No.		3	1	2	ACETONE BLANK	H2O BLANK	109	108
Date Weighed		8-18-80	8-18-80	8-18-80	8-18-80	8-18-80	5-21-80	5-21-80
Tare Wt.	1	104.7466	94.0606	100.5886	95.7225	95.5548	0.8654	0.8604
	2	104.7470	94.0601	100.5887	95.7223	95.5547	0.8652	0.8605
	3	104.7466	94.0602	100.5888	95.7221	95.5543	0.8653	0.8606
	4							
	5							
	6							
	Avg	104.7467	94.0603	100.5887	95.7223	95.5546	0.8653	0.8605
Bottle No.					ACETONE BLANK	H2O BLANK		
Content		Impinger (Water)	Probe (Acetone)	Probe (Water)	~~Cyclone~~ (~~Acetone~~)	~~Flask~~ ~~(Dry)~~		
Rinse (ml)		525	265	430	100	130		
Date Weighed or 250 Bake)		8-20-80	8-19-80	8-20-80	8-19-80	8-19-80	8-13-80	8-13-80
Final Wt. 250	1	104.7904	94.0761	100.6159	95.7244	95.5576	0.9037	0.8604
	2	104.7906	94.0761	100.6164	95.7242	95.5572	0.9037	0.8603
	3	104.7906	94.0757	100.6159	95.7232	95.5571	0.9036	0.8601
	4				95.7231			
	5				95.7227			
	6							
	Avg	104.7905	94.0760	100.6161	95.7230	95.5573	0.9036	0.8603
Residue Wt Final 250 Tare)		0.0438 0.0329 cor	0.0157 0.0138 cor	0.0274 0.0185 cor	0.0007 7x10^-6 g/ml	0.0027 2.08x10^-5 g/ml	0.0383 +0.0002 0.0385	-0.0002
Date Weighed or 650 Bake)								
Final Wt. 650	1							
	2							
	3							
	4							
	5							
	6							
	Avg							
Residue Wt. Final 650 Tare)								

Comments:

8830-5

Test No. 8/1-1P
Engr. TIDONA

STACK DATA

Date 8/7/80 Location SITE 8 Unit No. KILN Fuel COAL
Load ______ K#/hr or MBtu/hr ______ Filter No. #109A
Sample Box No. ______ Meter Box No. ______ Probe No. ______ Probe Length [illegible]
Stack Moisture 4 %
Ambient Temperature 95 °F
Nozzle Diameter 0.245 in.
Atmospheric Pressure 29.45 in.Hg
Stack Gas Pressure, Ps -.36 iwg
Stack Area, As 10'4" ft²

BLANK FILTER #108A
Remarks:
Final Meter: 1981.63
Initial Meter: 1913.72
TOTAL 67.91

LEAK CK
START 0 @ 15
FINISH 0 @ 15

Time	Vm (CF)	Vacuum (in. Hg)	ΔP (iwg)	ΔH (iwg)	T_s (°F)	$T_{imp.in}$ (°F)	$T_{imp.out}$ (°F)	T_{filter} (°F)	T_m (°F)
"		.5	.45	.85	320	140	65	270	95/90
"		.5	.5	.98	340	190	75	260	90/95
"		.5	.45	.85	325	220	80	360	95/100
"		.5	.45	.85	325	220	80	280	100/105
"		.45	.4	.78	325	200	80	250	100/105
"		.4.5	.4	.78	320	220	85	280	100/105
"		.45	.4	.78	325	230	90	310	100/105
"		.5	.45	.85	325	230	90	300	105/110
"		.4	.35	.7	325	190	70	270	105/110
"		.4	.35	.7	325	200	80	270	105/110
TOTAL									
AVER.			0.42	0.81	326				101

HP-67 KEYED CALCULATION SHEET*

PARTICULATE EMISSION CALCULATIONS

Test No. 8/1- A Date 8-8-80 Location 8 Engr. [illegible]

Unit No Precalciner Kiln Fuel Coal Sampling Train and Method Andersen Mark III

Pitot Factor, Fs .837 Barometric Pressure, P_{bar} 29.36 (STO 0) in. Hg

Tot. Liquid Collected, V_{lc} 100.3 (STO 1) ml Total Particulate, M_n ~42 (STO 2) m gm

Velocity Head, ΔP 0.42 (STO 3) iwg Stack Temp., Ts 385 (STO 4) °F Stack Area, As 83.86 (STO 5) ft^2

Sample Volume, Vm 15,242 (STO 6) ft^3 Stack Press., Psg -0.36 (STO 7) iwg Excess O_2, XO_2% 13.0 (STO 8) %

Orifice Press. Diff., H 0 (STO 9) iwg, (Flue Gas Density/Air Density) @ T_s, Gs 0.97 (STO A) n.d.

Sample Time, θ 120 (STO B) min Nozzle Dia., Dn 0.250 (STO C) in. Meter Temp., T_m 115 (STO D) °F

Select F_e	Oil (A)	Gas (B)	Coal (C)	Other:
SC Feet/10^4 Btu	92.2	87.4	98.2	(_)

Press (E) if meter is not temperature compensated.

1. Sample Gas Volume $Vm_{std} = 0.0334\ Vm(P_{bar} + H/13.6)$ 104.1649 SCF
2. Water Vapor $Vw_{std} = 0.0474\ V_{lc}$ 4.7542 SCF
3. Moisture Content $Bwo = Eq.\ 2/(Eq.\ 1 + Eq.\ 2)$ 0.0436 N.D.
4. Concentration a. $C = 0.0154\ Mn/Vm_{std}$ 0.0062 grains/DSCF
   b. $C = 2.205 \times 10^{-6}\ Mn/Vm_{std}$ 8.89×10^{-7} lb/DSCF
   c. $C = Eq.\ 4b \times 16.018 \times 10^3$ 0.0142 grams/DSCM
5. Abs. Stack Press. $Ps = P_{bar} \times 13.6 + Psg$ 398.936 in. w abs.
6. Stack Gas Speed $Vs = 174\ Fs \sqrt{\Delta PTs} \sqrt{\frac{407}{Ps} \times \frac{1.00}{Gs}}$ 2790 ft/min
7. Stack Gas Flow Rate @ 70°F a. $Qsw = Eq.\ 6 \times As \times \frac{530}{Ts} \times \frac{Ps}{407}$ 143833 WSCF/min
   b. $Qsd = Eq.\ 7a \times (1. - Eq.\ 3)$ 137555 DSCF/min
8. Material Flow $Ms = Eq.\ 7b \times Eq.\ 4b \times 60$ 7.339 lb/hr
9. XO_2 factor $XO_2f = 2090/(20.9 - XO_2\%)$ 264.557 N.D.
10. Emission a. $E = Eq.\ 4b \times Fe \times Eq.\ 9$ 0.0231 lb/MMBtu
    b. $E = Eq.\ 4c \times Fm \times Eq.\ 9 \times 1000$ 9.933 ng/joule
11. % Isokinetic $I = \frac{14077 \times Ts(Vm_{std} + Vw_{std})}{\theta \times Vs \times Ps \times Dn^2}$ 155.2 %

*If calculating by hand:
1) Convert T_s and T_m to °R
2) Multiply EQ 1 by $530/T_m$(°R) if meter not temperature compensated.
3) $F_m = 2.684 \times 10^{-5} \times F_e$

Data Sheet 6002-4
Revised 9/27/78

Test No. 8/1-1A

Engr. TIDONA

STACK DATA

Date 8/1-1A Location SITE 8 Unit No. CEMENT KILN Fuel COAL

Load 120 TON/PER HR K#/hr or MBtu/hr ______ Filter No. ______

Sample Box No. ______ Meter Box No. ______ Probe No. ______ Probe Length ______

Stack Moisture 8.7 %

Ambient Temperature 95 °F

Nozzle Diameter .245 in.

Atmospheric Pressure 29.36 in.Hg

Stack Gas Pressure, Ps ___ iwg

Stack Diameter ~~Area, As~~ 10'4" ft^2

Remarks:

Final Meter: 130.097

Initial Meter: 014.855

115.242

LEAK CK .0 @15

1274 Time	Vm (CF)	Vacuum (in. Hg)	ΔP (iwg)	ΔH (iwg)	T_s (°F)	$T_{imp.in}$ (°F)	$T_{imp.out}$ (°F)	T_{filter} (°F)	T_m (°F)
0		9	.42		361				110
10		9	.42		365				112
20		9	.42		368				114
30		9	.42		372				115
40		9	.42		383				112
50		9	.42		387				114
60		9	.42		390				115
10		9	.42		399				116
20		9	.42		398				116
30		9	.42		396				116
40		9	.42		397				116
50		9	.42		398				118
60		9	.42		397				118
TOTAL									
AVER.					385				115

ANDERSEN CASCADE IMPACTOR DATA

Test No. 8/1-1A Location 8 Owner

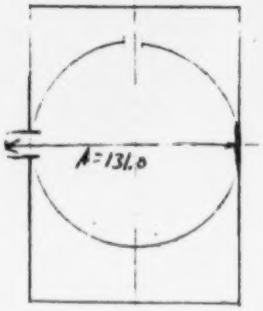
Impactor No. Nozzle Size 0.250 in. Filter No.

Stack Temperature 385 °F Impactor Flow Rate 0.96 CFM

Plate	Tare (g)	Final (g)	Net (g)	%	Cum. %	ECD (μ)
1 509	0.1858	0.1940	0.0082	19.6	80.4	11.6
2 553	0.1967	0.2061	0.0094	22.5	57.9	7.3
3 529	0.1855	0.1935	0.0080	19.1	38.8	4.9
4 513	0.1974	0.2046	0.0072	17.2	21.6	3.4
5 516	0.1845	0.1918	0.0073	17.5	4.1	2.2
6 520	0.1938	0.1951	0.0013	3.1	1.0	1.1
7 515	0.1876	0.1880	0.0004	1.0	0	0.66
8 581	0.1832	0.1832	0.0	0	0	0.44
Back Up* Filter 578	0.1978	0.1912	0,0	0	0	<0.44

Data Sheet 6002-5

SMOKESTACK FLOW PROFILE



NO.
LOCATION NO. 8
DATE
SAMPLING LOCATION
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) 131.0 BAROMETRIC PRESS, in.Hg
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) 6.5 STACK PRESS., Ps, iwg -0.36
STACK I.D. (DISTANCE A - DISTANCE B) 124.5 STK. GAS SP. GRAVITY, G_s
NEAREST UPSTREAM DISTURBANCE
NEAREST DOWNSTREAM DISTURBANCE

TRAVERSE POINT NUMBER	% OF STACK DIAMETER	DISTANCE FROM INSIDE WALL	VELOCITY HEAD (ΔP_s), in. H_sO	STACK TEMPERATURE (T_s, °F	OXYGEN %	STACK GAS SPEED, Vs ft/min
1.	4.4		0.35	~400 F	13.7	
2.	14.6		0.48			
3.	29.6		0.48			
4.	70.4		0.46			
5.	85.4		0.47			
	95.6					
	4.4		0.37			
8.	14.6		0.46			
9.	29.6		0.50			
10.	70.4		0.49			
11.	85.4		0.46	↓	↓	
12.	95.6					
13.						
14.						
15.						
16.						
17.						
18.						
Average			[illegible]			

STACK GAS SPEED, $V_s = 174\, F_s \sqrt{\overset{\text{Average}}{\Delta P}(T_s + 460)\left(\frac{407}{P_s}\right)\left(\frac{1.00}{G_s}\right)}$

60-23
rev. 11/74

KVB
A Research Cottrell Company

SO_x DATA SHEET (GOKSOYR-ROSS METHOD)

Test No. 8/1-1G Date 8/8/80 Location SITE 8

Unit No. CEMENT KILN Fuel COAL

Capacity ______ Unit Type CEMENT KILN

Engr. TIDONA Conditions 120 tons/hr Kiln feed

Meter Finish 005.034

Meter Start 001.744

Sample Volume Collected = 3,290 ADCF

P_{BAR} 29.36

% O_2 13%

Start Time	Stop Time	Elapsed Time (minutes)
12:00	12:30	.30

Total Sampling Time = 30 min.

LEAK CK 0@15

12:00 Time	Meter Vac. ("Hg)	Temperatures (°F)					Sample Flow Rate (ADCFM)
		Meter	Coil In	Coil Out	Water Bath	Stack	
5	6	112	140	144	377	377	0.075
10	6	112	168	143	380	380	0.075
15	2	114	178	143	377	377	0.075
20	1	116	178	153	377	377	0.075
25	1	115	178	154	380	380	0.075
30	4	115	178	156	380	380	0.075
12:40	Finish						

NOTES: (1) Sample flow rate at meter should be 0.075 ADCFM or 0.01 cf/8 secs.

(2) Total sample volume collected should be ~1.5 cf (~ 20 minutes sampling time).

Data Sheet KVB 6015-37
Rev.4/80

KVB
A Research-Cottrell Company

DATE 8/8/80

TEST NO. 81-G

SOx DATA SHEET

UNIT NO. ____ FUEL COAL LOAD 120 tons feed/hr LOCATION 8

Calculation: SO_3 or SO_2, ppm at stack O_2 = $\frac{(A - B) \times N \times F \times (460 + T) \times 24}{V (P + p)}$

Excess O_2 13.0 %

A = Ml of NaOH used for sample

B = Ml of NaOH used for blank

N = Normality of NaOH titrant

F = Dilution factor

T = Average temp. in gas meter, °F

V = Volume of gas sample, ft^3

P = Barometric pressure, in. Hg

p = Pressure in gas meter, in. Hg gage

	SO_2				SO_3				SO_x			
	#1	#2	#3		#1							
A =	9.2	8.8	9.0		0							
B =	0	0	0		0							
N =	0.019	.019	.019		.019							
F =	5.0	5.0	5.0		1.0							
T =	114				114							
V =	3.290				3.290							
P =	29.36				29.36							
p =	0				0							
Concentration, ppm at stack O_2, dry =	125	120	122		0							
Average Concentration, ppm at stack O_2, dry =	122				0				122			
lb/MBtu =												
ng/J =												

DATA SHEET NO. 60-14
Rev. 1/2/75
Rev. 2-3/25/80

LOCATION 9 - WET PROCESS CEMENT KILN

ROTARY KILN DESIGN DATA

Location No. 9 **Unit No.** 1

Unit Description

Unit was a rotary wet feed cement Kiln

Installation Date	1956
Process Capacity	32 tons /Hr.
Burner Description	Pulv. Coal Burner
Test Fuel	Pulv. Coal
Combustion Air Temperature at Burner	coal air temp. ≈ 130 °F secondary air temp. ~ 1600 °F
Length of Kiln	415'
Diameter of Kiln	12'

Comments:

MOBILE LABORATORY DATA

Test No.________

Test No.________ Date Tues. 8/19/80 Location No. 9 Engr. Buening

Unit No. 1 Fuel Coal Capacity 30t/Hr. of clinker

Unit Type cement kiln Burner Type Pulv. coal burner

1. Test No.	9-1		9-2		9-3		9-4		9-5	
2. Date Tues. 8/19/80										
3. Time	1130		1230		1530		1600		1630	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position	center									
8. Oxygen (%)	2.8		2.5		1.5		2.0		1.5	
9. NOx (hot) read/3% O_2 (ppm)*	132	131	130	126	110	102	104	99	101	93
10. NO (hot) read/3% O_2 (ppm)*	129	128	128	125	108	100	100	93	94	87
11. NO_2 (hot) read/3% O_2 (ppm)*	3	3	2	2	2	2	4	4	7	6
12. NO (cold) read/3% O_2 (ppm)*	197	195	187	182	190	175	157	149	185	171
13. Carbon Dioxide (%)	> 20%		> 20%		> 20%		> 20%		> 20%	
14. Carbon Monoxide (ppm) uncor/cor*	130	129	130	126	117	108	170	161	130	120
15. Hydrocarbon (ppm) uncor/cor*	—		—		—		—		—	
16. Sulfur Dioxide (ppm) uncor/cor*	340	336	760	739	1060	179	1560	1478	1035	955
17. Smoke Spot (Bacharach)	200-500 ppm		500-800 ppm		800-1200 ppm		1000-1600 PPM		800-1200 PPM	
18. Atmos. Temp. (°F/°C)										
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)										
21. Relative Humidity (%)										
22.										
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.________

Test No.________ Date 8/20/80 Location 9 Engr. K.

Unit No. 1 Fuel Coal Capacity 30t/Hr. of clinker

Unit Type cement Kiln Burner Type Pulv. coal burner

1. Test No.	9-6		9-7		9-8		9-9		9-10	
2. Date 8-20-80										
3. Time	1000		1100		1200		1300		1400	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position	center									
8. Oxygen (%)	2.75%		2.75%		3.0%		2.8%		2.6%	
9. NOx (hot) read/3% O_2 (ppm)*	136				109		118		113	
10. NO (hot) read/3% O_2 (ppm)*	135				108		117		110	
11. NO_2 (hot) read/3% O_2 (ppm)*	1				1		1		3	
12. NO (cold) read/3% O_2 (ppm)*	185	183	175	173	165	165	190	188	157	154
13. Carbon Dioxide (%)	>20%		>20%		>20%		>20%		>20%	
14. Carbon Monoxide (ppm) uncor/cor*	170	168	190		175	175	190	188	170	166
15. Hydrocarbon (ppm) uncor/cor*										
16. Sulfur Dioxide (ppm) uncor/cor*	1470 1300 - 1700		900		790		960		1270	
17. Smoke Spot (Bacharach)			H2O in system - NO Wet Readings taken							
18. Atmos. Temp. (°F/°C)										
19. Dew Point Temp. (°F/°C)							Calibrations @ 1305		Calibrated all inst @ 1400 hrs.	
20. Atmos. Pressure (in. Hg)										
21. Relative Humidity (%)					Calibrations at 1210					
22.										
23. charts speed 4" per. hr.										
24.										
25. CO inst 0-2000 ppm										
26. CO2 inst 0-20% scale										
27. O2 inst. 0-25% scale										
28. SO2 inst. 0-2000 ppm										
29. NO inst. 0-1000 ppm										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.______

Test No. 9-3 Date 8/20/80 Location 9 Engr. H. Buening

Unit No. 1 Fuel Coal Capacity 30t/Hr of clinker

Unit Type Cement Kiln Burner Type Pulv. coal burner

1. Test No.	9-11		9-12		9-13		9-14			
2. Date Wed. 8/20/80										
3. Time	1500		1600		1700		1800			
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position center										
8. Oxygen (%)	3.1%		2.75%		2.9		3.1%			
9. NOx (hot) read/3% O_2 (ppm)*	97		95		94		85			
10. NO (hot) read/3% O_2 (ppm)*	94		87		93		83			
11. NO_2 (hot) read/3% O_2 (ppm)*	3		8		1		2			
12. NO (cold) read/3% O_2 (ppm)*	150	151	145	143	153	152	139	140		
13. Carbon Dioxide (%)	>20%		>20%		>20%		>20%			
14. Carbon Monoxide (ppm) uncor/cor*	190	191	186	184	144	143	190	191		
15. Hydrocarbon (ppm) uncor/cor*										
16. Sulfur Dioxide (ppm) uncor/cor*	1030		830		1056		765			
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)										
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)										
21. Relative Humidity (%)										
22.			Calibrations @ 1345							
23. Charts speed 4" per hr.										
24.										
25. CO inst. 0-2000 ppm										
26. CO_2 inst. 0-20% scale										
27. O_2 inst. 0-25% scale										
28. SO_2 inst. 0-2000 ppm										
29. NO inst. 0-1000 ppm										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.________

Test No.________ Date 8/21/80 Location No. 9 Engr. H. Buening

Unit No. 1 Fuel Coal Capacity 30t/Hr. of clinker

Unit Type cement kiln Burner Type Pulv. coal burner

1. Test No.	9-15		9-16		9-17		9-18		9-19	
2. Date 8/21/80										
3. Time	1030		1100		1130		1200		1230	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position Center										
8. Oxygen (%)	2.85%		2.9%		2.7%		2.9%		3.6%	
9. NOx (hot) read/3% O_2 (ppm)*	134		111		121		133		131	
10. NO (hot) read/3% O_2 (ppm)*	129		108		121		128		127	
11. NO_2 (hot) read/3% O_2 (ppm)*	5		3		0		5		4	
12. NO (cold) read/3% O_2 (ppm)*	186	185	176	175	182	179	192	191	187	193
13. Carbon Dioxide (%)	>20%		>20%		>20%		>20%		>20%	
14. Carbon Monoxide (ppm) uncor/cor*	190	189	180	179	170	167	160	159	146	151
15. Hydrocarbon (ppm) uncor/cor*										
16. Sulfur Dioxide (ppm) uncor/cor*	1120		1088		1110		1260		490	
17. Smoke Spot (Bacharach)	1000-1200 ppm		1000-1200 ppm		1100-1250 ppm		1100-1400 ppm		390-600 ppm	
18. Atmos. Temp. (°F/°C)										
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)										
21. Relative Humidity (%)										
22.										
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.

Test No. Date 8/21/80 Location 9 Engr. H. Buening

Unit No. 1 Fuel coal Capacity 30 t /Hr. of clinker

Unit Type cement kiln Burner Type Pulv. coal burner

1. Test No.	9-20		9-21		9-22		9-23		9-24	
2. Date 8/21/80										
3. Time	1400		1430		1500		1530		1600	
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position Center										
8. Oxygen (%)	4.1 %		8.0		3.85%		3.9 %		4.6 %	
9. NOx (hot) read/3% O_2 (ppm)*	115		116		143		123		160	
10. NO (hot) read/3% O_2 (ppm)*	110		110		140		116		154	
11. NO_2 (hot) read/3% O_2 (ppm)*	5		6		3		7		6	
12. NO (cold) read/3% O_2 (ppm)*	187	199	185	196	207	218	185	195	245	269
13. Carbon Dioxide (%)	>20%		>20%		>20%		> 20%		22%	
14. Carbon Monoxide (ppm) uncor/cor*	146	155	160	169	146	154	160	168	145	159
15. Hydrocarbon (ppm) uncor/cor*										
16. Sulfur Dioxide (ppm) uncor/cor*	450		400		300		525		140	
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)	92°F									
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)										
21. Relative Humidity (%)	40%									
22.										
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.________

Test No. 9-41 Date 8/21/80 Location 9 Engr. Buening

Unit No. 1 Fuel coal Capacity 30 t/Hr of clinker

Unit Type cement kiln Burner Type pulv. coal burner

1. Test No.	9-25					
2. Date 8/21/80						
3. Time	1630					
4. Load						
5. Process Rate						
6. Flue Diam. or Size, ft						
7. Probe Position center						
8. Oxygen (%)	2.5					
9. NOx (hot) read/3% O_2 (ppm)*	83					
10. NO (hot) read/3% O_2 (ppm)*	77					
11. NO_2 (hot) read/3% O_2 (ppm)*	6					
12. NO (cold) read/3% O_2 (ppm)*	130	126				
13. Carbon Dioxide (%)	>20%					
14. Carbon Monoxide (ppm) uncor/cor*	510	496				
15. Hydrocarbon (ppm) uncor/cor*						
16. Sulfur Dioxide (ppm) uncor/cor*	480					
17. Smoke Spot (Bacharach)						
18. Atmos. Temp. (°F/°C)						
19. Dew Point Temp. (°F/°C)						
20. Atmos. Pressure (in. Hg)						
21. Relative Humidity (%)						
22.						
23.						
24.						
25.						
26.						
27.						
28.						
29.						
30.						

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

MOBILE LABORATORY DATA

Test No.________

Test No.__________ Date 8/23/80 Location No. 9 Engr. H. Bruning

Unit No. 1 Fuel coal Capacity 30 t/Hr. of clinker

Unit Type cement Kiln Burner Type pulv. coal burner

1. Test No.	9-26		9-27		9-28					
2. Date 8/23/80										
3. Time	0730		0745		0800					
4. Load										
5. Process Rate										
6. Flue Diam. or Size, ft										
7. Probe Position center										
8. Oxygen (%)	1.2%		.85 %		1.2 %					
9. NOx (hot) read/3% O_2 (ppm)*	148		163		270					
10. NO (hot) read/3% O_2 (ppm)*	155		160		269					
11. NO_2 (hot) read/3% O_2 (ppm)*	7		3		6					
12. NO (cold) read/3% O_2 (ppm)*	235	214	220	197	350	318				
13. Carbon Dioxide (%)	24 %		720%		19.8%					
14. Carbon Monoxide (ppm) uncor/cor*	128	116	2000	1791	160	145				
15. Hydrocarbon (ppm) uncor/cor*										
16. Sulfur Dioxide (ppm) uncor/cor*	840		>2000		815					
17. Smoke Spot (Bacharach)										
18. Atmos. Temp. (°F/°C)										
19. Dew Point Temp. (°F/°C)										
20. Atmos. Pressure (in. Hg)										
21. Relative Humidity (%)										
22.										
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										

*Correction to 3% O_2 should not be performed if the value is measured on a wet basis.

Data Sheet 6002-2

UNIT OPERATING DATA Test No._______

Test No._______ Date 8-19-80 Location SITE # 9 Engr. H. BUENING

Unit No. #1 Fuel PULVERIZED COAL Capacity 30 TON/HR

Unit Type ROTARY KILN Burner Type 2 PULVERIZED COAL BURNER

1. Test Number	9-1	9-2	9-3	9-4	9-5
2. Date	8-19-80	8-19-80	8-19-80	8-19-80	8-19-80
3. Time	11:30	12:30	15:42	16:17	16:43
4. Load					
5. Process Rate					
6. Kiln Rev. Indic.	57536	57596	57791	57827	57854
7. Fuel Air Temp. (°F)	132	132	132	132	132
8. Rear Draft ("H_2O)	3.4	3.4	3.4	3.4	3.4
9. Cooler Fan Dmpr. Setpt.	26	26	24.5	24.5	24.5
10. Cooler Vent Dampr. Setpt	19.1	18.5	19.1	19.1	19.1
11. Feeder Rev. Indic.	64845	65107	65955	66112	66231
12. C.R. O_2 (%)	1.2	1.1	1.0	0.6	1.0
13. C.R. CO (%)	0	0	0	0	0
14. Cooler Bed Depth (inch)	2.8	2.8	2.5	2.5	2.5
15. Cooler Undergr. air("H20)	3.8	3.8	3.8	3.8	3.8
16. Rear Temp. (°F)	419	416	420	419	418
17. Chain Matl. Temp (°F)	1280	1280	1290	1280	1280
18. Second Air Temp (°F)	1520	1550	1630	1595	1570
19. Prim. Air Temp (°F)	132	132	132	132	132
20. Mill inlet air temp(°F)	460	460	490	485	480
21. Prim air fan inlet press ("H20)	2.4	2.4	2.4	2.4	2.4
22. Prim. air setpt.	12	12	13	13	13
23. Coal mill feeder speed (RPM)	1400	1400	1400	1400	1400
24. Coal mill Amps	115	115	110	110	111
25. Slurry feeder speed (RPM)	3.9	4.0	4.0	4.0	4.0
26. No.1 Kiln Motor Amps	170	175	180	190	190
27. No.2 Kiln Motor Amps	170	160	170	185	185
28. Cooler fan Amps	125	120	122	122	122
29. Cooler exit fan Amps	130	130	125	125	125
30. ID Fan Amps	36	36	36	36	36

Data Sheet 6002-1

UNIT OPERATING DATA Test No.

Test No.______ Date 8-19-80 Location SITE #9 Engr. H.BUENING

Unit No. #1 Fuel PULVERIZED COAL Capacity 30 TON/HR

Unit Type ROTARY KILN Burner Type 2 PULVERIZED COAL BURNER

1. Test Number	9-1	9-2	9-3	9-4	9-5
2. Date	8-19-80	8-19-80	8-19-80	8-19-80	8-19-80
3. Time	11:30	12:30	15:42	16:17	16:43
4. Load					
5. Process Rate					
6. Mill Fan Amps			125	125	125
7.	BASELINE	BASELINE	BASELINE	BASELINE	BASELINE
8.	KILN NORMAL	PARTIC		PARTIC	PARTIC
9.	PARTIC				
10.					
11. COMMENTS:					
12.	C.R. CLOCK	WAS USED	FOR TIME.	CLOCK IS	10 MIN
13.	FAST	KILN 415'	LONG		
14.					
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

Data Sheet 6002-1

Test No.________

UNIT OPERATING DATA

Test No.________ Date 8-20-80 Location SITE #9 Engr. H. BUENING

Unit No. #1 Fuel PULVERIZED COAL Capacity 30 TON/HR

Unit Type ROTARY KILN Burner Type 1 PULVERIZED COAL BURNER

1. Test Number	9-6	9-7	9-8	9-9	9-10
2. Date	8-20-80	8-20-80	8-20-80	8-20-80	8-20-80
3. Time	10:09	11:01	11:59	12:59	13:59
4. Load					
5. Process Rate					
6. Kiln Rev. Indic.	58929	58981	59041	59101	59163
7. Fuel Air Temp. (°F)	132	132	132	132	132
8. Rear Draft ("H_2O)	-3.4	-3.4	-3.4	-3.4	-3.4
9. Cooler Fan Dmpr. Setpt.	25.1	25.1	25.1	25.1	25.1
10. Cooler Vent Dampr. Setpt	19	19	19	19	19
11. Feeder Rev. Indic.	70907	71134	71395	71654	71923
12. C.R. O_2 (%)	0.7	0.8	1.2	1.0	0.7
13. C.R. CO (%)	0	0	0	0	0
14. Cooler Bed Depth (inch)	2.6	2.5	2.6	2.4	2.7
15. Cooler Undergr. air("H20)	3.85	3.8	3.8	3.8	3.7
16. Rear Temp. (°F)	428	430	428	426	423
17. Chain Matl. Temp (°F)	1320	1320	1310	1300	1295
18. Second Air Temp (°F)	1680	1680	1710	1630	1660
19. Prim. Air Temp (°F)	132	132	132	132	132
20. Mill inlet air temp(°F)	470	450	420	410	475
21. Prim air fan inlet press ("H20)	2.3	2.3	2.4	2.4	2.3
22. Prim. air setpt.	12.5	12.5	12.5	12.5	13.0
23. Coal mill feeder speed (RPM)	1400	1400	1400	1220	1200
24. Coal mill Amps	115	130	115	115	115
25. Slurry feeder speed(RPM)	4.0	4.0	4.0	4.0	4.0
26. No.1 Kiln Motor Amps	190	190	200	180	190
27. No.2 Kiln Motor Amps	225	180	200	190	180
28. Cooler fan Amps	125	125	121	121	121
29. Cooler exit fan Amps	121	121	120	123	121
30. ID Fan Amps	36	36	35	35	36

Data Sheet 6002-1

UNIT OPERATING DATA

Test No.

Test No. Date 8-20-80 Location SITE #9 Engr. H. BUENING

Unit No. #1 Fuel PULVERIZED COAL Capacity 30 TON/HR

Unit Type ROTARY KILN Burner Type 1 PULVERIZED COAL BURNER

1. Test Number	9-6	9-7	9-8	9-9	9-10
2. Date	8-20-80	8-20-80	8-20-80	8-20-80	8-20-80
3. Time	10:09	11:01	11:59	12:59	13:59
4. Load					
5. Process Rate					
6. Mill Fan Amps	125	128	129	131	128
7.					
8. COMMENTS:	COAL	BINS FULL	@ 11:58	COAL SCALE	397193.5
9.					TONS
10.	KILN	12' DIAMETER			
11.					
12.					
13.					
14.					
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

Data Sheet 6002-1

UNIT OPERATING DATA

Test No._____

Test No._____ Date 8-20-80 Location SITE #9 Engr. H. Buening

Unit No. #1 Fuel Pulverized Coal Capacity 30 TON/HR

Unit Type Rotary Kiln Burner Type 1 Pulverized Coal Burner

1. Test Number	9-11	9-13	9-14		
2. Date	8-20-80	8-20-80	8-20-80		
3. Time	15:14	16:58	17:58		
4. Load					
5. Process Rate					
6. Kiln Rev. Indic.	59241	59346	59408		
7. Fuel Air Temp. (°F)	132	132	132		
8. Rear Draft ("H_2O)	3.4	3.4	3.3		
9. Cooler Fan Dmpr. Setpt.	25	25	25		
10. Cooler Vent Dampr. Setpt	19	19	19		
11. Feeder Rev. Indic.	72263	72724	72993		
12. C.R. O_2 (%)	.6	1.0	1.0		
13. C.R. CO (%)	0	0	0		
14. Cooler Bed Depth (inch)	2.5	2.5	2.4		
15. Cooler Undergr. air ("H20)	3.8	3.7	3.7		
16. Rear Temp. (°F)	424	416	415		
17. Chain Matl. Temp (°F)	1300	1310	1330		
18. Second Air Temp (°F)	1680	1635	1680		
19. Prim. Air Temp (°F)	132	132	132		
20. Mill inlet air temp (°F)	475	470	490		
21. Prim air fan inlet press ("H20)	2.2	2.3	2.2		
22. Prim. air setpt.	13	13	12.9		
23. Coal mill feeder speed (RPM)	1400	1300	1300		
24. Coal mill Amps	115	115	115		
25. Slurry feeder speed (RPM)	4.0	4.0	4.0		
26. No.1 Kiln Motor Amps	185	210	190		
27. No.2 Kiln Motor Amps	200	200	220		
28. Cooler fan Amps	120	120	121		
29. Cooler exit fan Amps	121	121	121		
30. ID Fan Amps	36	36	35		

Data Sheet 6002-1

UNIT OPERATING DATA .   Test No.__ ___

Test No.________ Date 8-20-80 Location SITE # 9 Engr. H. BUENIOF

Unit No. #1 Fuel PULVERIZED COAL Capacity 30 TON / HR

Unit Type ROTARY KILN Burner Type 1 PULVERIZED COAL BURNER

1. Test Number	9-11	9-13	9-14		
2. Date	8-20-80	8-20-80	8-20-80		
3. Time	15:14	16:58	17:58		
4. Load					
5. Process Rate					
6. Mill Fan Amps	125	125	125		
7.					
8. COMMENTS:	COAL	BINS FULL	15:18	SCALE	397222.2
9.					TONS
10.					
11.					
12.					
13.					
14.					
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

Data Sheet 6002-1

UNIT OPERATING DATA . Test No.________

Test No.____________ Date 8-21-80 Location SITE # 9 Engr. H. BUENING

Unit No. # 1 Fuel PULVERIZED COAL Capacity 30 TON/HR

Unit Type ROTARY KILN Burner Type 1 PULVERIZED COAL BURNER

1. Test Number	9-18	9-22	9-23	9-24	9-25
2. Date	8-21-80	8-21-80	8-21-80	8-21-80	8-21-80
3. Time	12:00	14:53	15:45	16:00	16:30
4. Load					
5. Process Rate					
6. Kiln Rev. Indic.	60501	60678	60732	60747	60777
7. Fuel Air Temp. (°F)	132	132	132	132	132
8. Rear Draft ("H_2O)	3.4	3.4	3.7	3.5	3.5
9. Cooler Fan Dmpr. Setpt.	25.1	25.1	25.1	25.1	25.1
10. Cooler Vent Dampr. Setpt	19	19	19	19	19
11. Feeder Rev. Indic.	77754	78525	78759	78828	78958
12. C.R. O_2 (%)	0.9	2.5	2.5	3.5	.6
13. C.R. CO (%)	0	0	0	0	0
14. Cooler Bed Depth (inch)	2.7	2.5	2.6	2.4	2.9
15. Cooler Undergr. air ("H2O)	3.8	3.8	3.8	3.8	3.8
16. Rear Temp. (°F)	429	432	433	433	441
17. Chain Matl. Temp (°F)	1300	1300	1300	1300	1300
18. Second Air Temp (°F)	1690	1610	1580	1580	1620
19. Prim. Air Temp (°F)	132	132	132	132	132
20. Mill inlet air temp (°F)	440	470	445	430	420
21. Prim air fan inlet press ("H2O)	2.4	2.1	2.3	2.3	2.0
22. Prim. air setpt.	12.8	12.0	12.0	12.0	12.0
23. Coal mill feeder speed (RPM)	1250	1580	1600	1680	1580
24. Coal mill Amps	120	120	123	122	123
25. Slurry feeder speed (RPM)	4.0	4.0	4.0	4.0	4.2
26. No.1 Kiln Motor Amps	200	180	180	180	210
27. No.2 Kiln Motor Amps	180	170	180	190	210
28. Cooler fan Amps	120	121	121	123	121
29. Cooler exit fan Amps	121	125	125	125	122
30. ID Fan Amps	36	34	36	36	36

Data Sheet 6002-1

UNIT OPERATING DATA .

Test No._______

Test No._______ **Date** 8-21-80 **Location** SITE #9 **Engr.** H. BUENING

Unit No. #1 **Fuel** PULVERIZER COAL **Capacity** 30 TON/HR

Unit Type ROTARY KILN **Burner Type** 1 PULVERIZED COAL BURNER

1. Test Number	9-18	9-22	9-23	9-24	9-25
2. Date	8-21-80	8-21-80	8-21-80	8-21-80	8-21-80
3. Time	12:00	14:53	15:45	16:00	16:30
4. Load					
5. Process Rate					
6. Mill Fan Amps	130	125	130	130	121
7.	BASELINE	O_2 SWING	O_2 SWING	O_2 SWING	O_2 SWING
8.	PARTIC				
9.					
10. COMMENTS:	COAL BINS	FULL @	7:10 AM	397352.6	TONS
11.	SECOND	AIR TEMP	700-800°F		
12.	COAL BINS	FULL @	15:15	397415.1	TONS
13.					
14.					
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

Data Sheet 6002-1

UNIT OPERATING DATA . Test No.______

Test No.______ Date 8-23-80 Location SITE# 9 Engr. H. BUENING

Unit No. #1 Fuel PULVERIZED COAL Capacity 30TON/HR

Unit Type ROTARY KILN Burner Type 1 PULVERIZED COAL BURNER

1. Test Number	9-26				
2. Date	8-23-80				
3. Time	7:22				
4. Load					
5. Process Rate					
6. Kiln Rev. Indic.	61988				
7. Fuel Air Temp. (°F)	132				
8. Rear Draft ("H_2O)	1.8				
9. Cooler Fan Dmpr. Setpt.	26				
10. Cooler Vent Dampr. Setp	19				
11. Feeder Rev. Indic.	84142				
12. C.R. O_2 (%)	005				
13. C.R. CO (%)	0				
14. Cooler Bed Depth (inch)	4.5				
15. Cooler Undergr. air("H2)	3.9				
16. Rear Temp. (°F)	424				
17. Chain Matl. Temp (°F)	1330				
18. Second Air Temp (°F)	1420				
19. Prim. Air Temp (°F)	132				
20. Mill inlet air temp(°F)	500				
21. Prim air fan inlet ("H20) press	1.95				
22. Prim. air setpt.	12				
23. Coal mill feeder (RPM) speed	1000				
24. Coal mill Amps	100				
25. Slurry feeder speed(RPM)	3.0				
26. No.1 Kiln Motor Amps	115				
27. No.2 Kiln Motor Amps	100				
28. Cooler fan Amps	130				
29. Cooler exit fan Amps	121				
30. ID Fan Amps	28.5				

Data Sheet 6002-1

UNIT OPERATING DATA . **Test No.**______

Test No.______ **Date** 8-23-80 **Location** SITE # 9 **Engr.** H. BUENING

Unit No. #7 **Fuel** PULVERIZED COAL **Capacity** 30 TON/HR

Unit Type ROTARY KILN **Burner Type** 1 PULVERIZED COAL BURNER

1. Test Number	9-26				
2. Date	8-23-80				
3. Time	7:22				
4. Load					
5. Process Rate					
6. Mill Fan Amps	125				
7.	KILN	UNDER	START-UP	CONDITIONS	
8.	FIRE LIT	@ 4:30 am			
9. COMMENTS:					
10.	SECOND	AIR PIPE	34" DIAMITER	OUTSIDE	
11.					
12.					
13.					
14.					
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

Data Sheet 6002-1

FUEL ANALYSIS

COAL:

SAMPLE TAKEN 8/20/80 AT 1:59 PM

TEST 9-10

Analysis report no. 71-55994

PROXIMATE ANALYSIS

	As Rec'd.	Dry Basis
%Moisture	2.38	xxxxx
%Ash	13.39	13.72
%Volatile	36.08	36.96
%Fixed Carbon	48.15	49.32
	100.00	100.00
Btu/lb.	12004	12297
%Sulfur	3.43	3.51

ULTIMATE ANALYSIS

	As Rec'd	Dry Basis
%Moisture	2.38	xxxxx
%Carbon	65.88	67.49
%Hydrogen	4.61	4.72
%Nitrogen	1.17	1.20
%Chlorine	0.10	0.10
%Sulfur	3.43	3.51
%Ash	13.39	13.72
%Oxygen (diff.)	9.04	9.26
	100.00	100.00

HP-67 KEYED CALCULATION SHEET*

PARTICULATE EMISSION CALCULATIONS

Test No. 9-1&9-2 Date 8-19-80 Location 9 Engr. B.

Unit No. 1 Fuel Coal Sampling Train and Method 5

Pitot Factor, Fs .83 Barometric Pressure, P_{bar} 30.0 (STO 0) in. Hg

Tot. Liquid Collected, V_{lc} 318.8 (STO 1) ml Total Particulate, M_n 24436.8 (STO 2) m gm

Velocity Head, ΔP .12 (STO 3) iwg Stack Temp., Ts 360 (STO 4) °F Stack Area, As 63.5 (STO 5) ft^2

Sample Volume, Vm 30.63 (STO 6) ft^3 Stack Press., Psg -8.5 (STO 7) iwg Excess O_2, XO_2% 2.6 (STO 8) %

Orifice Press. Diff., H .5575 (STO 9) iwg Stack Gas Sp. Gravity, Gs 1.0 (STO A) n.d.

Sample Time, θ 64 (STO B) min Nozzle Dia., Dn .375 (STO C) in. Meter Temp., T_m 97.5 (STO D) °F

Select F_e	Oil (A)	Gas (B)	✓ Coal (C)	Other:
SC Feet/10^4 Btu	92.2	87.4	98.2	(–)

Press [✓ (E)] if meter is not temperature compensated.

1. Sample Gas Volume $Vm_{std} = 0.0334\ Vm(P_{bar} + H/13.6)$ 29.22 SCF
2. Water Vapor $Vw_{std} = 0.0474\ V_{lc}$ 15.11 SCF
3. Moisture Content $Bwo = Eq.\ 2/(Eq.\ 1 + Eq.\ 2)$ .34 N.D.
4. Concentration a. $C = 0.0154\ Mn/Vm_{std}$ 12.88 grains/DSCF

   b. $C = 2.205 \times 10^{-6}\ Mn/Vm_{std}$ 0.00184 lb/DSCF

   c. $C = Eq.\ 4b \times 16.018 \times 10^3$ 29.54 grams/DSCM
5. Abs. Stack Press. $Ps = P_{bar} \times 13.6 + Psg$ 404.5 in. w abs.
6. Stack Gas Speed $Vs = 174\ Fs\ \sqrt{\Delta P Ts}\sqrt{\frac{407}{Ps} \times \frac{1.00}{Gs}}$ 1437 ft/min
7. Stack Gas Flow Rate @ 70°F a. $Qsw = Eq.\ 6 \times As \times \frac{530}{Ts} \times \frac{Ps}{407}$ 58608 WSCF/min

   b. $Qsd = Eq.\ 7a \times (1. - Eq.\ 3)$ 38629 DSCF/min
8. Material Flow $Ms = Eq.\ 7b \times Eq.\ 4b \times 60$ 4274.99 lb/hr
9. XO_2 factor $XO_2f = 2090/(20.9 - XO_2\%)$ 114.2 N.D.
10. Emission a. $E = Eq.\ 4b \times Fe \times Eq.\ 9$ 20.69 lb/MMBtu

    b. $E = Eq.\ 4c \times Fm \times Eq.\ 9 \times 1000$ 8894.97 ng/joule
11. % Isokinetic $I = \frac{14077 \times Ts(Vm_{std} + Vw_{std})}{\theta \times Vs \times Ps \times Dn^2}$ 97.81 %

*If calculating by hand:
1) Convert T_s and T_m to °R
2) Multiply EQ 1 by $530/T_m$(°R) if meter not temperature compensated.
3) $F_m = 2.684 \times 10^{-5} \times F_e$

Data Sheet 6002-4
Revised 2/15/78

HP-67 KEYED CALCULATION SHEET*

PARTICULATE EMISSION CALCULATIONS

Test No. 9-4&9-5 Date 8-19-80 Location 9 Engr. K.

Unit No. 1 Fuel Coal Sampling Train and Method 5

Pitot Factor, Fs .83 Barometric Pressure, P_{bar} 30.0 (STO 0) in. Hg

Tot. Liquid Collected, V_{1c} 191.4 (STO 1) ml Total Particulate, M_n 6768.1 (STO 2) m gm

Velocity Head, ΔP .12 (STO 3) iwg Stack Temp., Ts 360 (STO 4) °F Stack Area, As 63.5 (STO 5) ft^2

Sample Volume, Vm 18.06 (STO 6) ft^3 Stack Press., Psg -3.5 (STO 7) iwg Excess O_2, XO_2% 1.75 (STO 8) %

Orifice Press. Diff., H .5575 (STO 9) iwg Stack Gas Sp. Gravity, Gs 1.0 (STO A) n.d.

Sample Time, θ 40 (STO B) min Nozzle Dia., Dn .375 (STO C) in. Meter Temp., T_m 104 (STO D) °F

Select F_e	Oil (A)	Gas (B)	[✓ Coal (C)]	Other:
SC Feet/10^4 Btu	92.2	87.4	98.2	(☐)

Press (E) if meter is not temperature compensated.

1. Sample Gas Volume $Vm_{std} = 0.0334\ Vm(P_{bar} + H/13.6)$ 17.03 SCF
2. Water Vapor $Vw_{std} = 0.0474\ V_{1c}$ 9.07 SCF
3. Moisture Content Bwo = Eq. 2/(Eq. 1 + Eq. 2) .347 N.D.
4. Concentration a. $C = 0.0154\ Mn/Vm_{std}$ 15.16 grains/DSCF
   b. $C = 2.205 \times 10^{-6}\ Mn/Vm_{std}$ .00217 lb/DSCF
   c. $C = \text{Eq. 4b} \times 16.018 \times 10^3$ 34.78 grams/DSCM
5. Abs. Stack Press. $Ps = P_{bar} \times 13.6 + Psg$ 404.5 in. w abs.
6. Stack Gas Speed $Vs = 174\ Fs\ \sqrt{\Delta P Ts}\ \sqrt{\frac{407}{Ps} \times \frac{1.00}{Gs}}$ 1437 ft/min
7. Stack Gas Flow Rate @ 70°F a. $Qsw = \text{Eq. 6} \times As \times \frac{530}{Ts} \times \frac{Ps}{407}$ 58608 WSCF/min
   b. $Qsd = \text{Eq. 7a} \times (1. - \text{Eq. 3})$ 38236 DSCF/min
8. Material Flow $Ms = \text{Eq. 7b} \times \text{Eq. 4b} \times 60$ 4981.98 lb/hr
9. XO_2 factor $XO_2f = 2090/(20.9 - XO_2\%)$ 109.14 N.D.
10. Emission a. $E = \text{Eq. 4b} \times Fe \times \text{Eq. 9}$ 23.273 lb/MMBtu
    b. $E = \text{Eq. 4c} \times Fm \times \text{Eq. 9} \times 1000$ 10007.6 ng/joule
11. % Isokinetic $I = \dfrac{14077 \times Ts(Vm_{std} + Vw_{std})}{\theta \times Vs \times Ps \times Dn^2}$ 92.14 %

*If calculating by hand:
1) Convert T_s and T_m to °R
2) Multiply EQ 1 by $530/T_m$(°R) if meter not temperature compensated.
3) $F_m = 2.684 \times 10^{-5} \times F_e$

Data Sheet 6002-4
Revised 2/15/78

HP-67 KEYED CALCULATION SHEET*

PARTICULATE EMISSION CALCULATIONS

Test No. 9-18 Date 9-21-80 Location 9 Engr.

Unit No. 1 Fuel Coal Sampling Train and Method 5

Pitot Factor, Fs .83 Barometric Pressure, P_{bar} 29.86 (STO 0) in. Hg

Tot. Liquid Collected, V_{1c} 161.5 (STO 1) ml Total Particulate, M_n 14104.6 (STO 2) m gm

Velocity Head, ΔP .14 (STO 3) iwg Stack Temp., Ts 360 (STO 4) °F Stack Area, As 63.5 (STO 5) ft^2

Sample Volume, Vm 15.03 (STO 6) ft^3 Stack Press., Psg -3.3 (STO 7) iwg Excess O_2, XO_2% 2.85 (STO 8) %

Orifice Press. Diff., H .69375 (STO 9) iwg Stack Gas Sp. Gravity, Gs 1.0 (STO A) n.d.

Sample Time, θ 28 (STO B) min Nozzle Dia., Dn .375 (STO C) in. Meter Temp., T_m 96.25 (STO D) °F

Select F_e	Oil (A)	Gas (B)	Coal (C)	Other:
SC Feet/10^4 Btu	92.2	87.4	98.2	(D)

Press (E) if meter is not temperature compensated.

1. Sample Gas Volume $Vm_{std} = 0.0334\ Vm(P_{bar} + H/13.6)$ 14.3 SCF
2. Water Vapor $Vw_{std} = 0.0474\ V_{1c}$ 7.66 SCF
3. Moisture Content Bwo = Eq. 2/(Eq. 1 + Eq. 2) .349 N.D.
4. Concentration a. $C = 0.0154\ Mn/Vm_{std}$ 15.18 grains/DSCF
   b. $C = 2.205 \times 10^{-6}\ Mn/Vm_{std}$ 0.00217 lb/DSCF
   c. $C = \text{Eq. 4b} \times 16.018 \times 10^3$ 34.82 grams/DSCM
5. Abs. Stack Press. $Ps = P_{bar} \times 13.6 + Psg$ 402.8 in. w abs.
6. Stack Gas Speed $Vs = 174\ Fs \sqrt{\Delta P Ts} \sqrt{\frac{407}{Ps} \times \frac{1.00}{Gs}}$ 1555.5 ft/min
7. Stack Gas Flow Rate @ 70°F a. $Qsw = \text{Eq. 6} \times As \times \frac{530}{Ts} \times \frac{Ps}{407}$ 63170 WSCF/min
   b. Qsd = Eq. 7a x (1. - Eq. 3) 41152 DSCF/min
8. Material Flow Ms = Eq. 7b x Eq. 4b x 60 5368 lb/hr
9. XO_2 factor $XO_2f = 2090/(20.9 - XO_2\%)$ 115.8 N.D.
10. Emission a. E = Eq. 4b x Fe x Eq. 9 24.72 lb/MMBtu
    b. E = Eq. 4c x Fm x Eq. 9 x 1000 10629.95 ng/joule
11. % Isokinetic $I = \frac{14077 \times Ts(Vm_{std} + Vw_{std})}{\theta \times Vs \times Ps \times Dn^2}$ 102.76 %

*If calculating by hand:
1) Convert T_s and T_m to °R
2) Multiply EQ 1 by $530/T_m$(°R) if meter not temperature compensated.
3) $F_m = 2.684 \times 10^{-5} \times F_e$

Data Sheet 6002-4
Revised 2/15/78

PARTICULATE CALCULATION SHEET

Test No. 9-169-2 (Inlet, Outlet)
Box No.
Test Description: PARTICULATE, Baseline
Location SITE 9
Test Date 8/19/80

Dry Gas Meter Vol (ft3)
Final 2012.36
Initial 1981.73
Total 30.63

Impinger Water Vol (ml)

	1	2	3	Total	SILICA GEL
Final	264	140	2		499.6
Initial	100	100	0		486.8
Δ Vol	264	40	2	318.8	12.8

	Impinger (Water)	Probe (Acetone)	Probe (Water)	Cyclone catch ~~(Acetone)~~	Flask (Dry)	Filter No.	Blank No.
Beaker No.		1P	9			125	
Date Weighed							
Tare Wt. 1		99.6990	107.9705				
2		99.6987	107.9705				
3		99.6988	107.9707				
4							
5							
6							
Avg		99.6988	107.9706			.7771	
Bottle No.							
Rinse (ml)		325	1575				
Date Weighed or 250 Bake)						9-10-80	
Final Wt. 250 1		99.9544	116.0407	11.8146		5.5541	
2		99.9543	116.0410	11.8151		5.5543	
3		99.9543	116.0409	11.8150		5.5542	
4							
5							
6							
Avg		99.9543	116.0409	11.8149		5.5542	
Residue Wt Final 250 Tare)		0.2555	8.0703	11.8149		4.7771	
Date Weighed or 650 Bake)							
Final Wt. 650 1							
2							
3							
4							
5							
6							
Avg							
Residue Wt. Final 650 Tare)							

Comments:

```
 .2555
 8.0703
11.8149
 4.7771
24.9178
- .4810
24.4368
```

8830-5

PARTICULATE CALCULATION SHEET

Test No. 9-4 & 9-5 (Inlet, Outlet)
Box No. CV-3
Test Description: PARTICULATE, Gasoline

Location SITE 9
Test Date 8/19/80

Dry Gas Meter Vol (ft3)
Final 2031.42
Initial 2013.36
Total 18.06

Impinger Water Vol (ml)

	1	2	3	Total	
Final	163	120	2		469.5
Initial	100	100	0		463.1
△ Vol	163	20	2	191.4	6.4

						Filter No.	Blank No.
Beaker No.		5	2			126	
Date Weighed							
Tare Wt.	1	103.4771	95.3314				
	2	103.4770	95.3316				
	3	103.4771	95.3315				
	4						
	5						
	6						
	Avg	103.4771	95.3315			.7792	
Bottle No.							
Content	Impinger (Water)	Probe (Acetone)	Probe (Water)	Cyclone Cont (Acetone)	Flask (Dry)		
Rinse (ml)		450	1050				
.te Weighed or 250 Bake)							
Final Wt. 250	1	105.8470	99.5173	7.9198		3.6713	
	2	105.8469	99.5174	7.9201		3.6711	
	3	105.8471	99.5174	7.9202		3.6712	
	4						
	5						
	6						
	Avg	105.8470	99.5174	7.9200		3.6712	
Residue Wt Final 250 Tare)		2.3699	4.1859	7.9200		2.892	
Date Weighed or 650 Bake)							
Final Wt. 650	1						
	2						
	3						
	4						
	5						
	6						
	Avg						
Residue Wt. Final 650 Tare)							

Comments:

2.3699
4.1859
7.9200
2.8920
17.3678
- .5997
16.7681

8830-5

PARTICULATE CALCULATION SHEET

Test No. 9-18 (Inlet, Outlet)
Location SITE 9
Box No. CU-3
Test Date
Test Description: PARTICULATE

Dry Gas Meter Vol (ft3)
Final 2047.06
Initial 2032.03
Total 15.03

Impinger Water Vol (ml)

	1	2	3	Total	
Final	222	132	2		445.8
Initial	100	100	0		440.3
△ Vol	122	32	2	161.5	5.5

						Filter No.	Blank No.
Beaker No.		3	4			110A	
Date Weighed							
Tare Wt.	1	103.7429	92.7235				
	2	103.7480	92.7234				
	3	103.7426	92.7238				
	4						
	5						
	6						
	Avg	103.7428	92.7236			.8537	
Bottle No.							
Content	Impinger (Water)	Probe (Acetone)	Probe (Water)	Cyclone catch (~~Acetone~~)	Flask (Dry)		
Rinse (ml)		400	1125				
.te Weighed or 250 Bake)							
Final Wt. 250	1	103.8331	96.5378	8.5835		3.0141	
	2	103.8333	96.5377	8.5838		3.0143	
	3	103.8332	96.5382	8.5838		3.0141	
	4						
	5						
	6						
	Avg	103.8332	96.5379	8.5837		3.0142	
Residue Wt Final 250 Tare)		.0904	3.8143	8.5837		2.1605	
Date Weighed or 650 Bake)							
Final Wt. 650	1						
	2						
	3						
	4						
	5						
	6						
	Avg						
Residue Wt. Final 650 Tare)							

Comments:

.0904
3.8143
8.5837
2.1605
14.6489
-.5443
14.1046

KVB

Test No. 9-1 & 9-2

Engr. H. BUENINA

STACK DATA

Date 8-19-80 Location SITE 9 Unit No. CEMENT KILN Fuel COAL

Load ______ K#/hr or MBtu/hr ______ Filter No. # 125

Sample Box No. ______ Meter Box No. CU-3 Probe No. ______ Probe Length 10 S/S

Stack Moisture 30 EST. %

Ambient Temperature 112 °F

Nozzle Diameter .375 in.

Atmospheric Pressure 30.0 in.Hg

Stack Gas Pressure, Ps .35 iwg

Stack Area, As 63.5 ft²

Remarks:

Final Meter: 2012.36

Initial Meter: 1981.73

30.63

LEAK CK.

0 @ 15

10:57 Time	Vm (CF)	Vacuum (in. Hg)	ΔP (iwg)	ΔH (iwg)	T_s (°F)	$T_{imp.in}$ (°F)	$T_{imp.out}$ (°F)	T_{filter} (°F)	T_m (°F)	
5 min		.1	.03	.14	360	145	80	230	95	95
5		.2	.09	.42	360	145	80	250	95	100
5		.5	.16	.74	360	160	80	250	100	100
5		.6	.20	.93	360	160	70	270	100	105
11		.2	.03	.14	360	150	80	270	100	100
11		.45	.09	.42	360	160	80	250	105	110
11		.8	.16	.74	360	160	75	270	110	115
11	*	12	.20	.93	360	165	80	290	115	115
	*	.8								
		.7								
TOTAL										
AVER.			.12	.5575	360				97.5	

KVB DS 60-13

Rev. 5/79

KVB

Test No. 9-4 & 9-5
Engr. H. BUENING

STACK DATA

Date 8-19-80 Location SITE 9 Unit No. CEMENT KILN Fuel COAL
Load ______ K#/hr or MBtu/hr ______ Filter No. # 126
Sample Box No. ______ Meter Box No. CU-3 Probe No. ______ Probe Length 10 5/5
Stack Moisture 34 EST. %
Ambient Temperature 112 °F
Nozzle Diameter 3/8 in.
Atmospheric Pressure 30.00 in.Hg
Stack Gas Pressure, Ps 3.5 iwg
Stack Area, As 63.5 ft²

Remarks:
Final Meter: 2031.42
Initial Meter: 2013.36
18.06
LEAK CK
0 @ 15

Time	Vm (CF)	Vacuum (in. Hg)	ΔP (iwg)	ΔH (iwg)	T_s (°F)	$T_{imp.in}$ (°F)	$T_{imp.out}$ (°F)	T_{filter} (°F)	T_m (°F)
10 min		.1	.03	.14	360	150	70	250	100 / 100
10		.3	.09	.42	360	160.	70	270	100 / 105
10		.65	.16	.74	360	175	75	260	105 / 110
10		.85	.20	.93	360	175	75	280	110 / 115
TOTAL									
AVER.			.12	.5575	360				103.75

KVB DS 60-13
Rev. 5/79

Test No. 9-18
Engr. H. BUENING

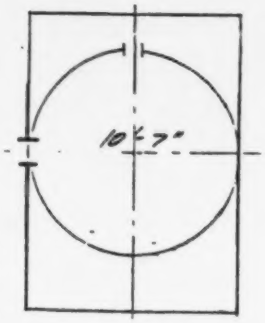
STACK DATA

Date 8-21-80 Location SITE 9 Unit No. CEMENT KILN Fuel COAL
Load ______ K#/hr or MBtu/hr ______ Filter No. 110 A
Sample Box No. ______ Meter Box No. CU-3 Probe No. ______ Probe Length 10 5/5
Stack Moisture 34 EST. %
Ambient Temperature ______ °F
Nozzle Diameter 3/8 in.
Atmospheric Pressure 29.86 in.Hg
Stack Gas Pressure, Ps-3.3 iwg
Stack Area, As 63.5 ft^2

Remarks:
Final Meter: 2047.06
Initial Meter: 2032.03
15.03
LEAK CK
0 @ 15

Time	Vm (CF)	Vacuum (in. Hg)	ΔP (iwg)	ΔH (iwg)	T_s (°F)	$T_{imp.in}$ (°F)	$T_{imp.out}$ (°F)	T_{filter} (°F)	T_m (°F)
7 min		2	.06	.3	360	130	70	250	90 / 95
7		4	.12	.6	360	150	75	260	95 / 100
7		7	.17	.85	360	165	75	275	100 / 105
7	*	10	.21	1.025	360	170	80	260	100 / 110
	*	START	1.1						
	*	FINISH	.95						
TOTAL									
AVER.			.14	.69375	360				96.25

KVB DS 60-13
Rev. 5/79

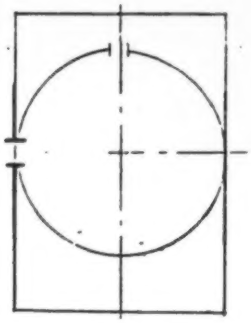


SMOKESTACK FLOW PROFILE

TEST NO. 9-1 & 9-2   9-4 & 9-5
LOCATION NO. 9
DATE 8-19-80
SAMPLING LOCATION Kiln outlet
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) ______ BAROMETRIC PRESS, in.Hg 30.00
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) ______ STACK PRESS., Ps, iwg -3.5
STACK I.D. (DISTANCE A - DISTANCE B) ____ STK. GAS SP. GRAVITY, G_S ______
NEAREST UPSTREAM DISTURBANCE
NEAREST DOWNSTREAM DISTURBANCE

TRAVERSE POINT NUMBER	% OF STACK DIAMETER	DISTANCE FROM INSIDE WALL	VELOCITY HEAD (ΔP_s), in. H_2O	STACK TEMPERATURE (T_s, °F	OXYGEN %	STACK GAS SPEED, Vs ft/min
1.		2'-1"	.20	361		
2.		4'-2"	.16	360		
3.		6'-3"	.09	360		
4.		8'-4"	.03	361		
5.						
(						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						
Average			.12			

$$\text{STACK GAS SPEED, } V_s = 174\ F_s \sqrt{\overset{\text{Average}}{\Delta P}(T_s + 460)\left(\frac{407}{P_s}\right)\left(\frac{1.00}{G_s}\right)}$$

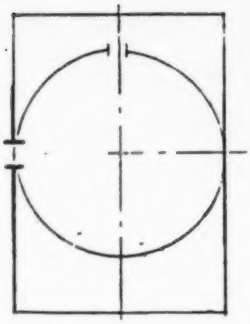


SMOKESTACK FLOW PROFILE

TEST NO. 9-18
LOCATION NO. 9
DATE 8-21-80
SAMPLING LOCATION Kiln outlet
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) ______ BAROMETRIC PRESS, in.Hg 29.86
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) ______ STACK PRESS., Ps, iwg -3.3
STACK I.D. (DISTANCE A - DISTANCE B) ____ STK. GAS SP. GRAVITY, G_s ____
NEAREST UPSTREAM DISTURBANCE ____
NEAREST DOWNSTREAM DISTURBANCE ____

TRAVERSE POINT NUMBER	% OF STACK DIAMETER	DISTANCE FROM INSIDE WALL	VELOCITY HEAD (Δp_s), in. H_sO	STACK TEMPERATURE (T_s, °F	OXYGEN %	STACK GAS SPEED, Vs ft/min
1.		2'-1"	.21	360		
2.		4'-2"	.17	360		
3.		6'-3"	.12	360		
4.		8'-4"	.06	360		
5.						
(						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						
Average						

STACK GAS SPEED, $V_s = 174\ F_s \sqrt{\overset{\text{Average}}{\Delta P}(T_s + 460)\ (\frac{407}{P_s})\ (\frac{1.00}{G_s})}$



SMOKESTACK FLOW PRÓFILE

TEST NO. 9-28
LOCATION NO. 9
DATE 8-23-80
SAMPLING LOCATION Kiln outlet
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) ______ BAROMETRIC PRESS, in.Hg 29.95
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) ______ STACK PRESS., Ps, iwg ______
STACK I.D. (DISTANCE A - DISTANCE B) ___ STK. GAS SP. GRAVITY, G_S ______
NEAREST UPSTREAM DISTURBANCE
NEAREST DOWNSTREAM DISTURBANCE

TRAVERSE POINT NUMBER	% OF STACK DIAMETER	DISTANCE FROM INSIDE WALL	VELOCITY HEAD (Δp_s), in. H_20	STACK TEMPERATURE (T_s, °F	OXYGEN %	STACK GAS SPEED, Vs ft/min
1. upper port		2'-1"	.14	366	Ps=-1.7	
2.		4'-2"	.11			
3.		6'-3"	.10			
4.		8'-4"	.04			
5.						
center pt.		2'-1"	.17			
(		4'-2"	.14	360	Ps=-2.1	
8.		6'-3"	.15			
9.		8'-4"	.11			
10.						
11 low port		2'-1"	.25			
12.		4'-2"	.2[illegible]	360	Ps=-2.1	
13.		6'-3"	.27			
14.		8'-4"	.25			
15.						
16.						
17.						
18.						
Average						

STACK GAS SPEED, $$V_s = 174\ F_s \sqrt{\overset{\text{Average}}{\Delta P}(T_s + 460)\left(\frac{407}{P_s}\right)\left(\frac{1.00}{G_s}\right)}$$